The EU Miracle: When 75 Million Reach High Income

Basile Grassi[1,2,3]

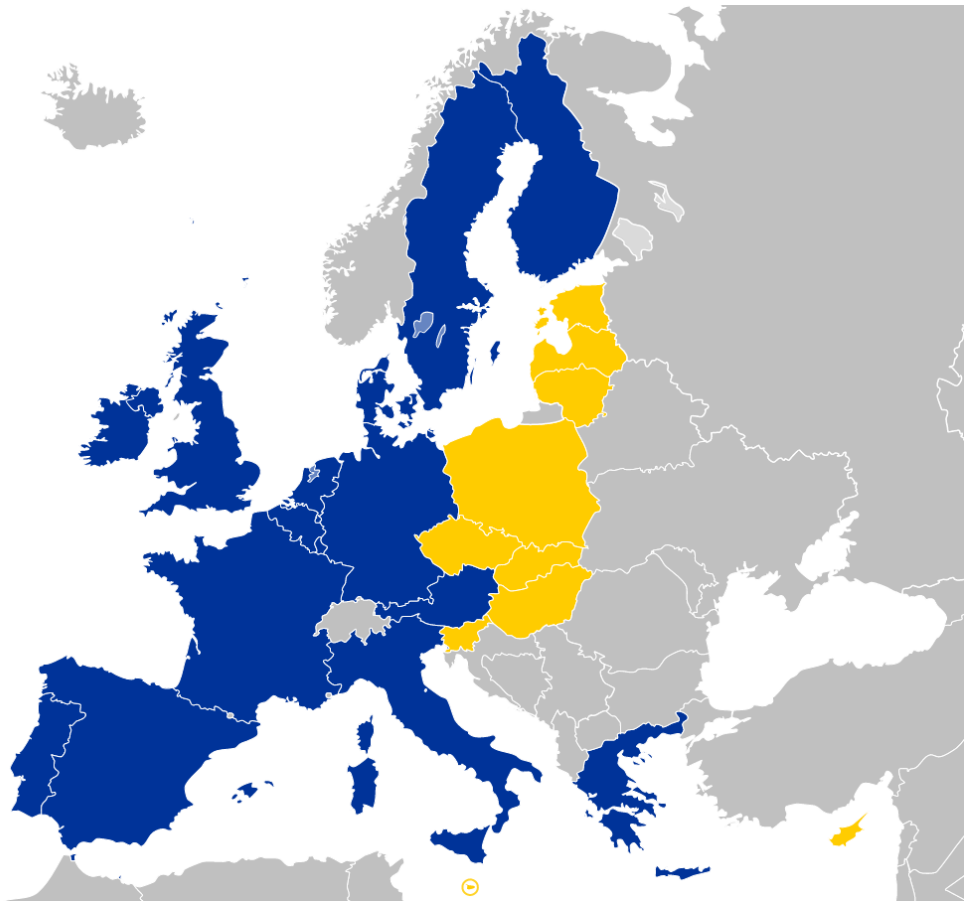
[1]Bocconi University
[2]IGIER & CEPR
[3]OFCE

Banca D'Italia
06/03/2025

Introduction

- The European Union was founded in 1957 in order to brought peace and prosperity to a continent that experienced war for at least 11 centuries.
- In 2024, it represents a population of 450 million people and 1/6 of world GDP.
- In 2004, 75 Millions people over 10 countries have joined the EU.
- The GDP per capita of these countries was 18,314 USD in 2004 and 34,753 USD in 2019.

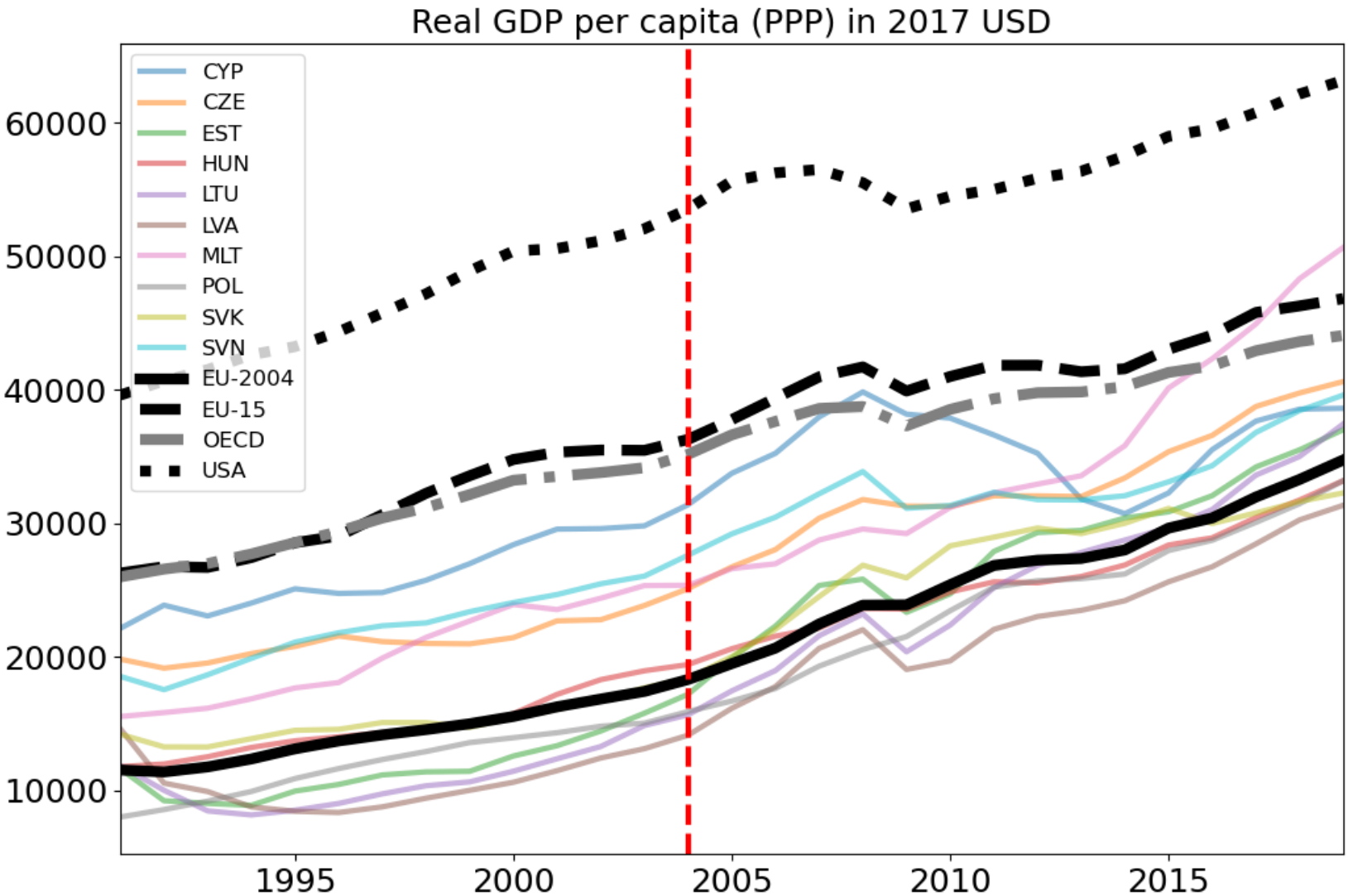
The EU in 1995 and the New Member States



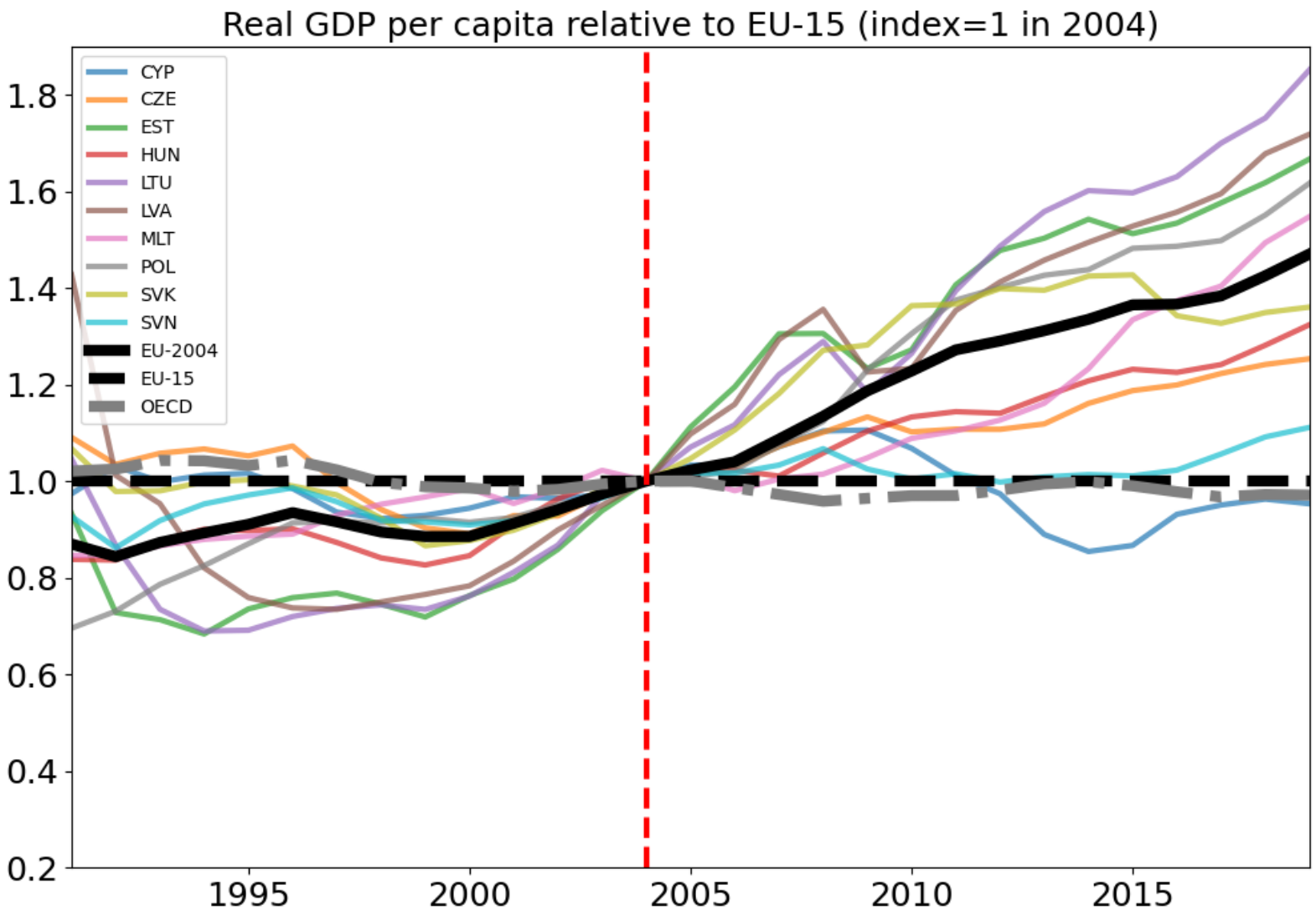
EU2004 (yellow): Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Hungary, Slovenia, Cyprus and Malta.

EU15 (blue): France, Germany, Netherlands, Belgium, Luxembourg, UK, Ireland, Autria, Danemark, Sweden, Finland, Italy, Spain, Portugal, Greece

GDP per Capita of New Member States



GDP per Capita relative to EU15



What is the effect of joining the EU?

- **Question:** What is the (causal?) effect of joining the EU on GDP per capita?
- **Challenge:** No countrol group available.
- **Synthetic Control Method:** construct a control group as a weighted average of donor countries.
- **Mechanism?** Is there convergence? Role of labor, capital, trade, FDI, regulation, misallocation, technology?

This paper

- Use Synthetic Control Method (SCM) to evaluate the role of EU on the EU2004's GDP per capita.
- Use SCM to evaluate the role of EU enlargement in the EU15's GDP per capita.
- Counterfactual Growth Accounting.
- Explore the mechanism: consumption, investment, govt spending, regulation, employment, capital, trade, FDI, regulations, misallocation and TFP.
- Run SCM on simulated data from a Neo-Classical Growth Model with distortion

Preview of the Results

- The EU2004's GDP per capita is 8,400 USD higher in 2019 thanks to joining the EU ($\approx$ 33% higher).
- No robust evidence of an effect on EU15's GDP per capita.
- The contribution to growth of TFP would have been 3 time smaller.
- Evidence of convergence in $\frac{C}{Y}$, $\frac{I}{Y}$, $\frac{G}{Y}$, $\frac{N}{L}$, $\frac{Ex}{Y}$, $\frac{Imp}{Y}$, $\frac{FDI}{Y}$, and regulation while TFP keep growing.
- Misallocation seems to have declined after 2004.
- SCM captures change in distortion in a Neo-Classical Growth Model

Why do we care?

- **Role of institution for growth:** Is the EU a perfect laboratory?
- **Middle-income to high-income:** does the EU has a recipe? A Challenge soon face by China and India.
- **Washington consensus:** The EU reforms still great for growth!

Litterature Review

- **Institutions and Growth:** Acemoglu, Johnson, Robinson (2001, 2002, 2005) Rodrik, Subramanian, Trebbi (2004), etc...
- **European Union** Alesina, Tabellini, Trebbi (2017), Head and Mayer (2021), Artis, Banerjee and Marcelino (2006), many work on the monetary union.
- **Brexit:** Sampson (2017), Broadbent, Di Pace, Drechsel, Harrison, Tenreyro (2024), Alabrese, Edenhofer, Fetzer, Wang (2024)
- **Washington Consensus vs Industrial Policy:** Rodrik (2008) , Liu (2019), Juhász, Lane, Rodrik (2023)
- **Synthetic Control:** Abadie and Gardeazabal (2003), Abadie, Diamond, Hainmueller (2010), Abadie (2021), Funke, Schularick and Trebesch (2023).
- **Macro Development:** Cheremukhin, Golosov, Guriev, and Tsyvinski (2017), Dauth, Findeisen, Lee, Porzio (2021), Fernández-Villaverde, Ohanian, Yao (2023)

The Adhesion Process and Accession Criteria

- **Maastricht Treaty, 1 November 1993:** Possibility of Enlargement to Former Communist Countries, Cyprus and Malta.

- **Copenhagen Criteria, 1993-1995:**
  1. Stability of democracy, the rule of law, human rights and respect for and protection of minorities
  2. Functioning market economy
  3. Effectively implement the rules, standards and policies that make up the body of EU law

- **Agenda 2000, March 1999:** New Financial Framework for the period 2000-2006

- **Adhesion, 1 May 2004:** Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Hungary, Slovenia, Cyprus and Malta formally joined the EU.

Table of Contents

Table of Contents

Data

- **Cross-country data:** Penn World Table 10.0 for all aggregate GDP, Population, Comsumption, Investment, etc..
- **FDI:** UN Trade and Development (UNCTAD)
- **Regulation:** Product Market regulation (PMR) from OECD measure the regulatory barriers to firm entry and competition.
- **Misallocation:** CompNet which gives moments of firm-level distribution for some countries.

Table of Contents

Synthetic Control Method

- Let us call Y_{1t} for all t, the variables of interest (ex: GDP per capita) of the treated unit (EU2004 or EU-15).
- Let us call Y_{ct} for $c \geq 2$ for all t, the variables of interest of the untreated donor pool.
- Y_{ct} can take two value $Y_{ct}(0)$ if untreated and $Y_{ct}(1)$ if treated.
- I observe these for $T_0 + T_1$ years. Country $c = 1$ is treated from $T_0 + 1$, the other country are never treated.
- $Y_{1t}(0)$ is the counterfactual untreated values of the variables of interest.
- With some weights w_c, we can construct the synthetic control estimator of the untreated unit for all periods:

$$\forall t, \quad \widehat{Y}_{1t}(0) \equiv \sum_{i=2}^{N+1} w_c Y_{ct}(0).$$

Synthetic Control Method

- Y a vector of covariates for the treated country (ex: GDP per capita in the pre-treatment period).
- X the matrix of covariates for the countries in the donor pool.
- The synthetic control method is choosing a vector of weigts W which minimizes

$$(Y - X'W)'V(Y - X'W)$$

  subject to $w_c \geq 0$ and $\sum_{c=2}^{N+1} w_c = 1$.

  Where the positive semi-definitive symetric matrix V are chosen in a data-driven way.

- Abadie, Diamond and Hainmuelle (2010) shows that this estimator is unbiased when $Y_{1t}(0)$ is a VAR, and, provide a bias bound for a linear factor model.

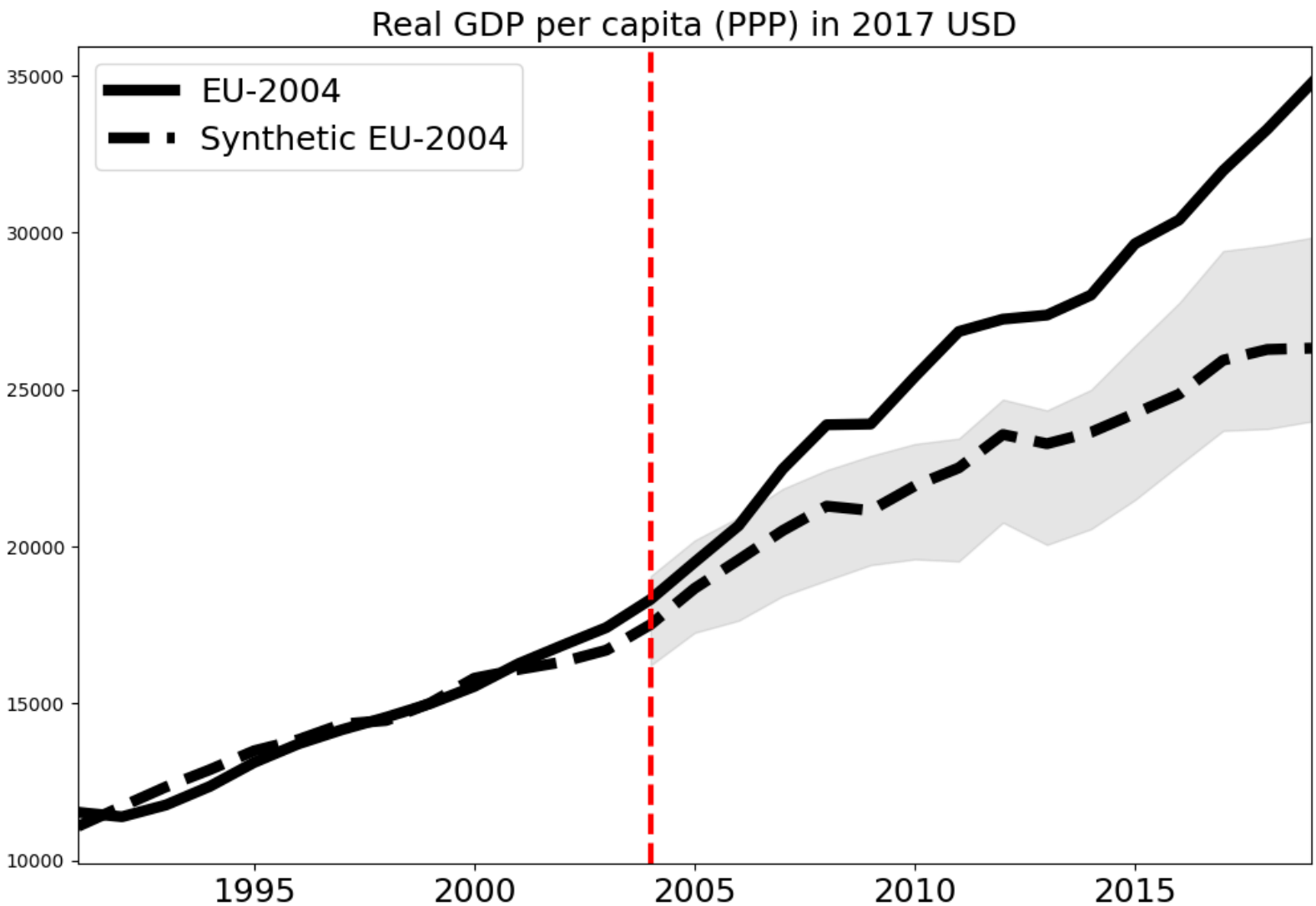
Baseline Specification

- Match on GDP per capita from 1991 to 2003.
- Donor pool: OECD countries that never joined the EU

  Australia, Canada, Chile, Colombia, Costa Rica, Iceland, Israel, Japan, Mexico, New Zealand, Norway, Republic of Korea, Switzerland, Turkey, and, United States

- Explore alternative specification (with investment rate, trade share, GDP growth, etc..)
- Standard-Errors (Cattaneo et al. 2021, 2022) constructed from in-sample and out-of-sample uncertainty. (MonteCarlo - 200 reps)

Results: EU2004 More



Results: EU2004

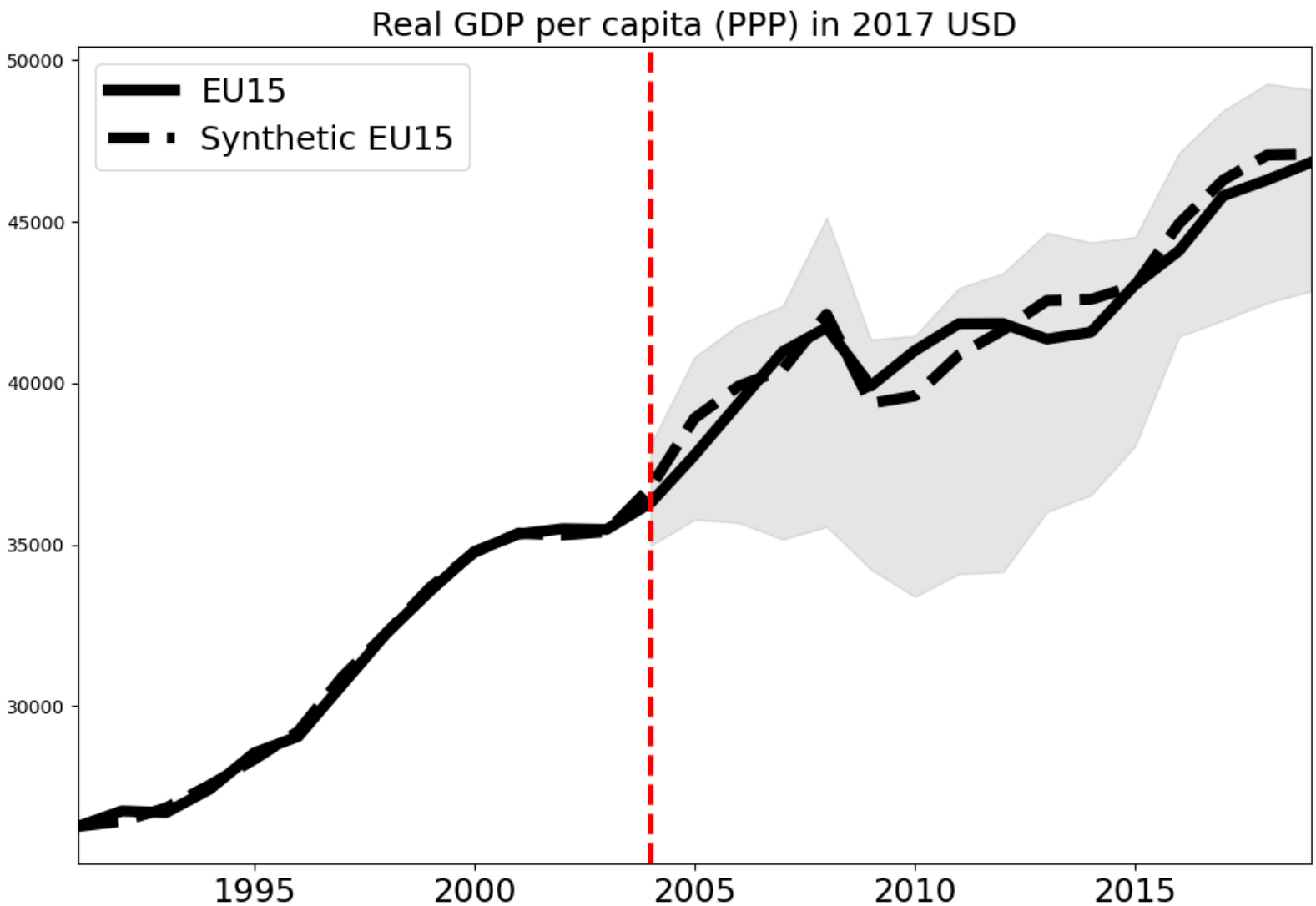
Synthetic control results:

Covariate	V	Treated	Synthetic Control	Bias	Average Donor	Bias
GDP per Capita in..						
1991	0.0612	11533.0596	11082.0146	-3.91%	23190.9247	101.08%
1992	0.0596	11388.6465	11716.4494	2.88%	23535.6076	106.66%
1993	0.0596	11764.3584	12341.1939	4.90%	24119.9876	105.03%
1994	0.0620	12359.5957	12891.0506	4.30%	24790.4758	100.58%
1995	0.0630	13118.0664	13490.8219	2.84%	25587.6576	95.06%
1996	0.0667	13707.8486	13843.0256	0.99%	26439.0512	92.88%
1997	0.0734	14164.7422	14343.6993	1.26%	27442.9589	93.74%
1998	0.0798	14558.5430	14457.0190	-0.70%	27862.2649	91.38%
1999	0.0884	14995.0449	15012.2190	0.11%	28796.9457	92.04%
2000	0.0966	15541.6777	15803.9351	1.69%	29908.6620	92.44%
2001	0.0972	16264.1855	16081.9852	-1.12%	30101.6537	85.08%
2002	0.0957	16849.3047	16321.7311	-3.13%	30181.2751	79.12%
2003	0.0967	17419.2266	16698.5434	-4.14%	30449.7200	74.81%

The synthetic EU2004 composition:

Country	Weights
Costa Rica	0.772
Republic of Korea	0.126
Norway	0.102

Results: EU15 More



Results: EU15

Synthetic control results:

Covariate	V	Treated	Synthetic Control	Bias	Average Donor	Bias
GDP per Capita in..						
1991	0.0611	26282.3945	26282.4317	0.00%	23190.9247	-11.76%
1992	0.0591	26759.1191	26440.9700	-1.19%	23535.6076	-12.05%
1993	0.0589	26707.2695	26852.8946	0.55%	24119.9876	-9.69%
1994	0.0613	27439.8594	27565.7262	0.46%	24790.4758	-9.66%
1995	0.0624	28554.9199	28353.2997	-0.71%	25587.6576	-10.39%
1996	0.0660	29064.7246	29218.9952	0.53%	26439.0512	-9.03%
1997	0.0729	30660.3262	30906.4337	0.80%	27442.9589	-10.49%
1998	0.0799	32254.3242	32263.6002	0.03%	27862.2649	-13.62%
1999	0.0886	33572.7422	33681.2250	0.32%	28796.9457	-14.23%
2000	0.0969	34788.8750	34759.5526	-0.08%	29908.6620	-14.03%
2001	0.0980	35331.0000	35357.4331	0.07%	30101.6537	-14.80%
2002	0.0968	35494.7734	35299.8881	-0.55%	30181.2751	-14.97%
2003	0.0981	35473.7422	35404.1858	-0.20%	30449.7200	-14.16%

The synthetic EU15 composition

Country	Weights
Australia	0.290
Iceland	0.247
Israel	0.215
Costa Rica	0.146
Norway	0.072
Canada	0.030

EU Effect in 2019 More

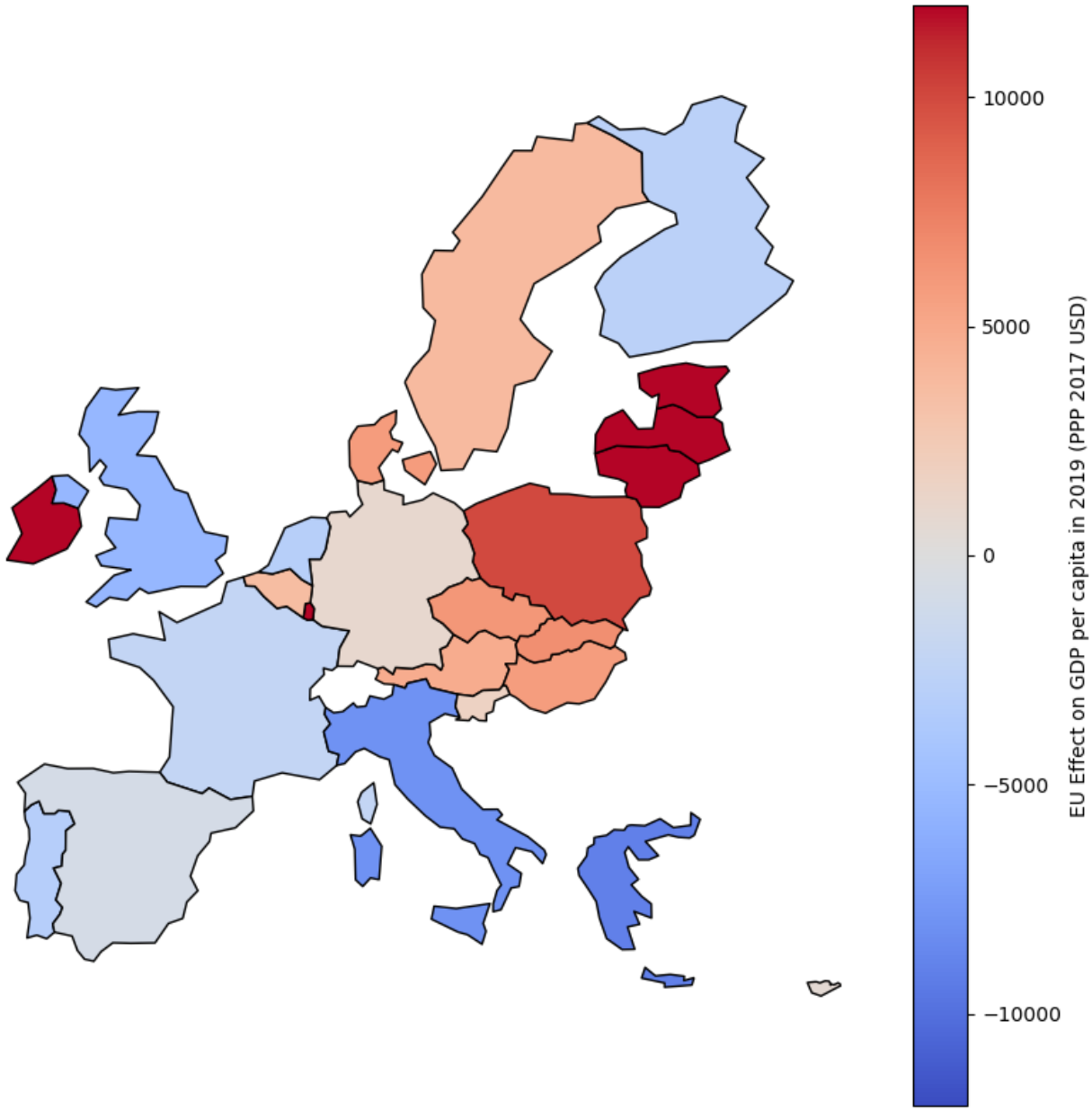


Table of Contents

Robustness

- **Leave-One-Out**: Remove iteratively countries with non-negative weights from the donor pool. More
- **In-Country Placebo**: Compare treatment effect for untreated countries and treated country. More
- **In-Time Placebo**: Change the treatment date. More
- **Alternative Donor Pool**: Geographical Europe, Above Median GDP per capita, ex-communist countries/non-EU G20 More

Table of Contents

Growth Accounting

Following, Solow (1957) and Baqaee and Farhi (2018):

$$g_Y = g_R + \overline{\frac{rK}{Y}}_{04-19} g_K + \overline{\frac{wl}{Y}}_{04-19} g_L$$

Using a synthetic control for each variables, we get

	g_Y GDP	g_R Residual	$\overline{\frac{rK}{Y}}_{04-19} g_K$ Capital	$\overline{\frac{wl}{Y}}_{04-19} g_L$ Labor
EU2004	3.98	2.53	1.62	0.49
Synthetic EU2004	2.04	0.88	1.05	0.30

Note: The variables used in PWT 10.0 are $K =$`cn`, $L =$`emp`, $rK =$`irr*cn` and $\frac{wL}{Y} =$`labsh`.

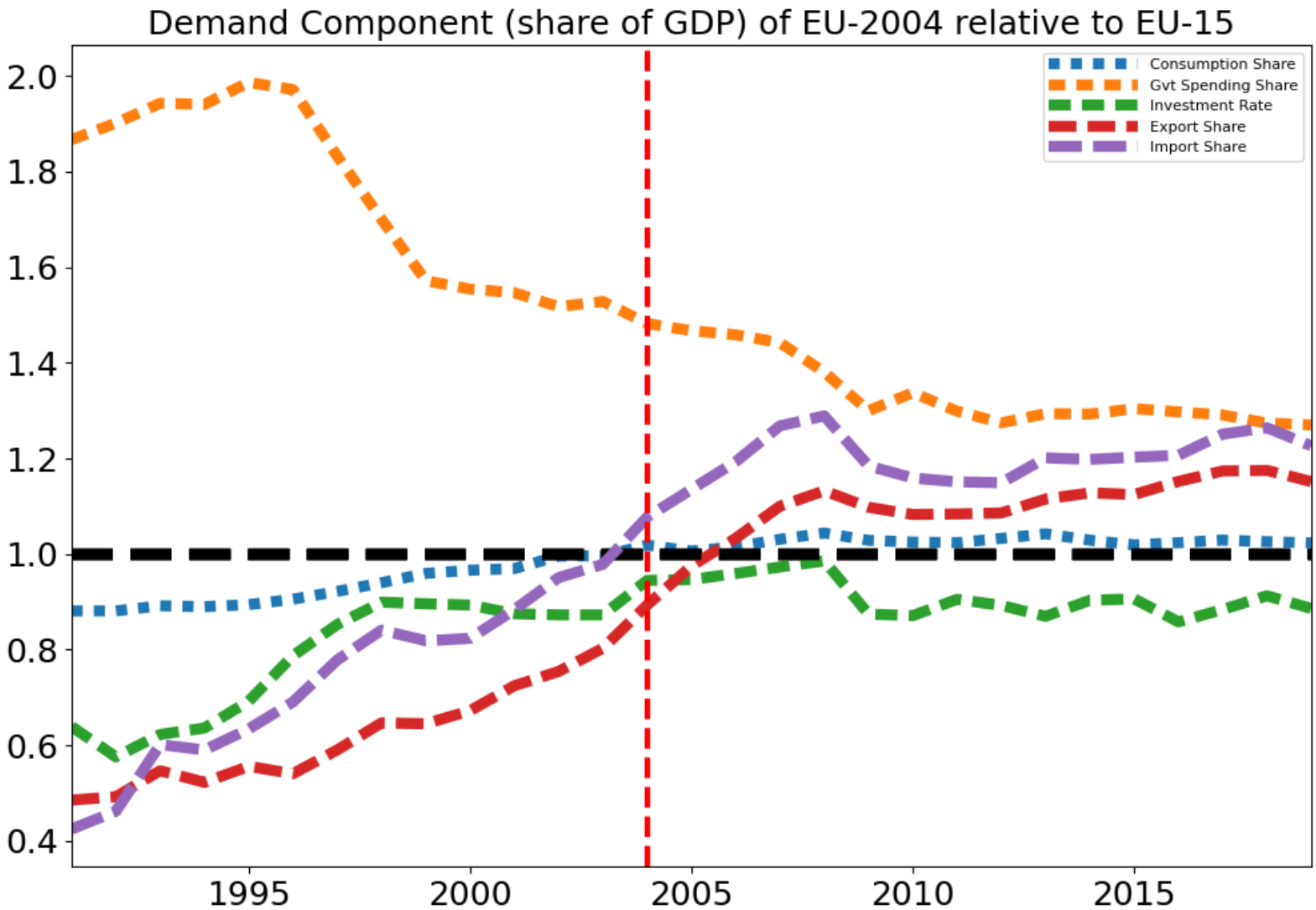
Growth Accounting

The EU2004 versus the Synthetic Control:

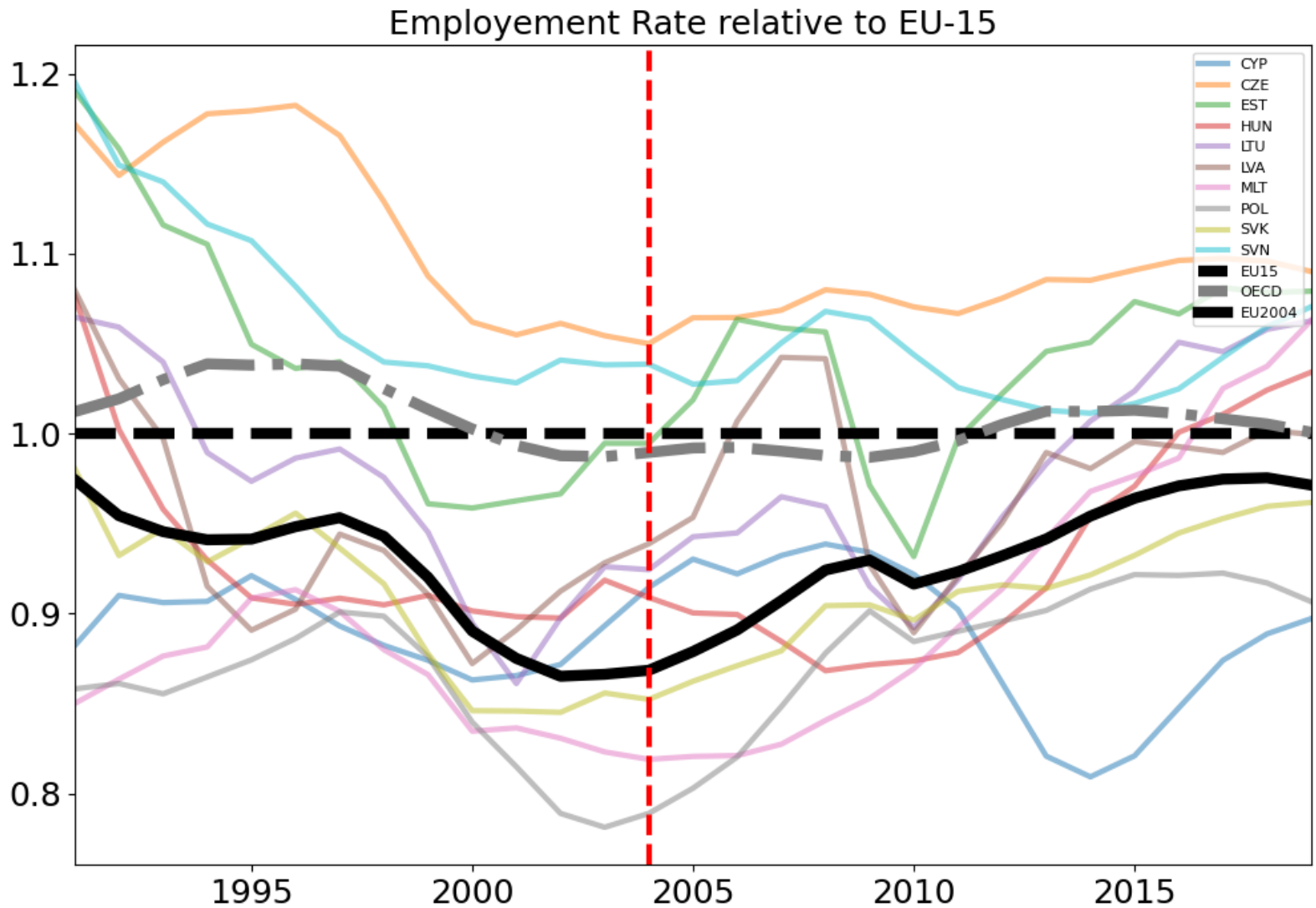
- Almost 2pp GDP growth difference.
- Growth of the Residual almost 3 times larger.
- Around 60% larger contribution of capital and labor.

Table of Contents

Demand Component

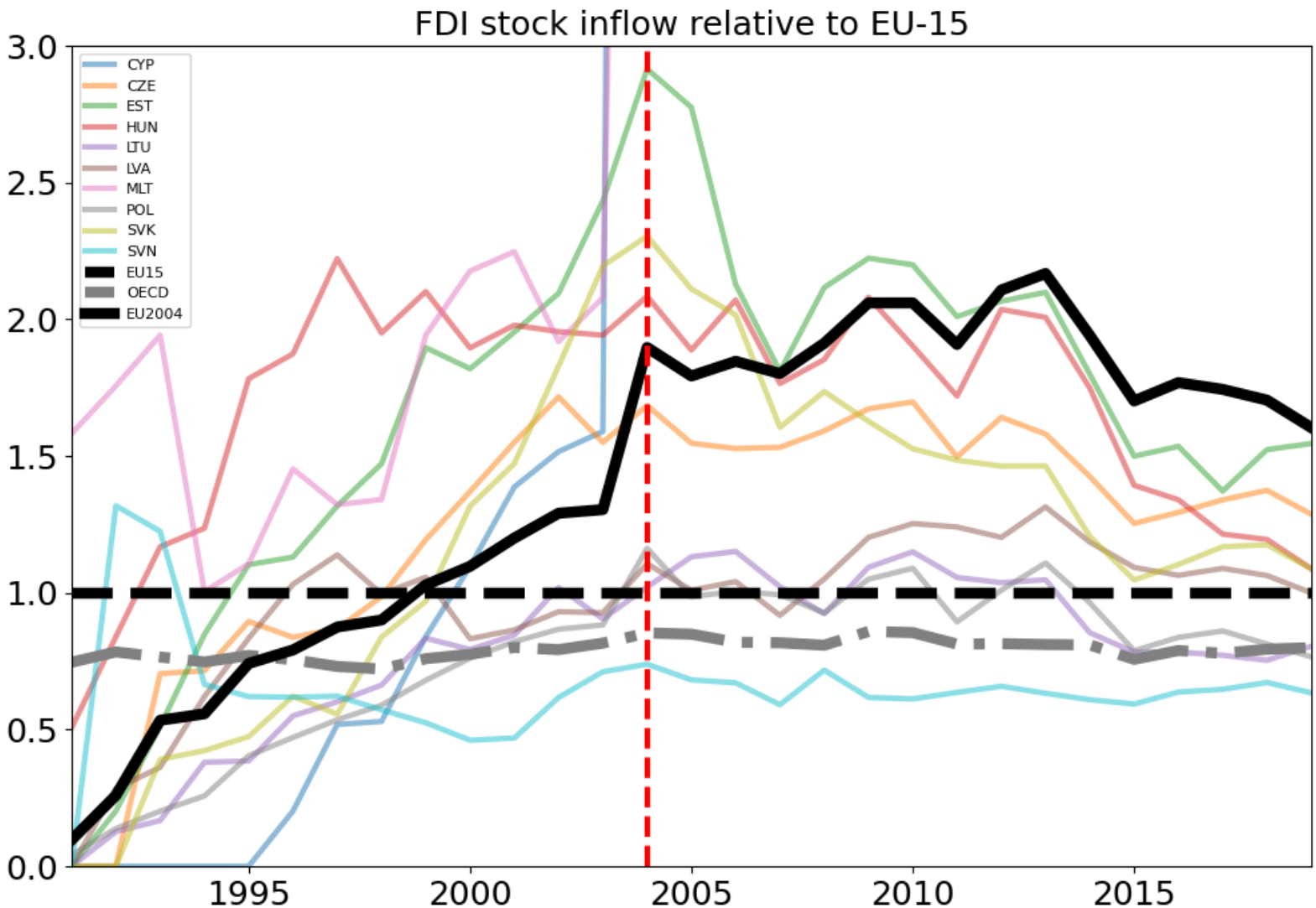


Employment Rate

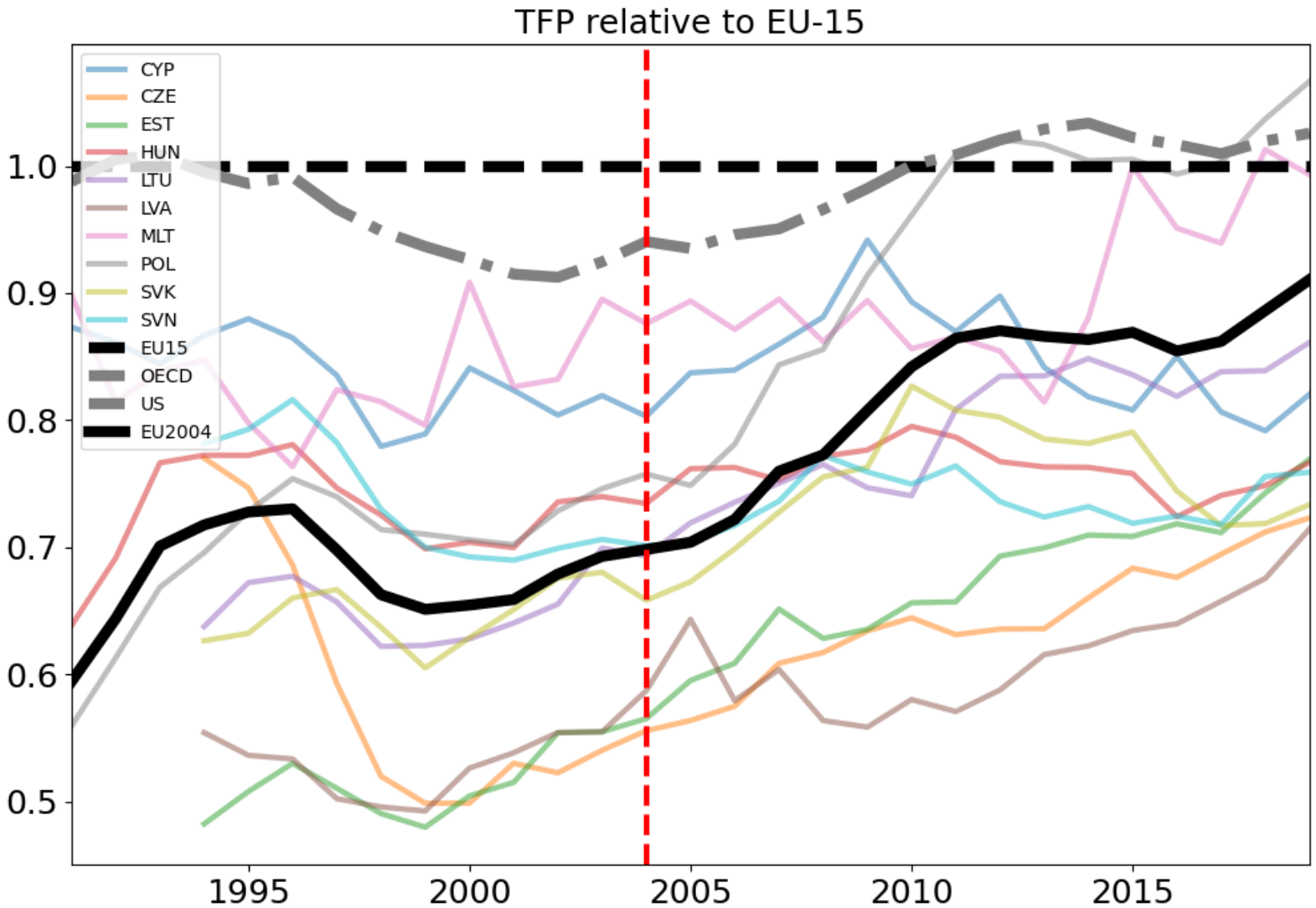


FDI Share

UNCTAD

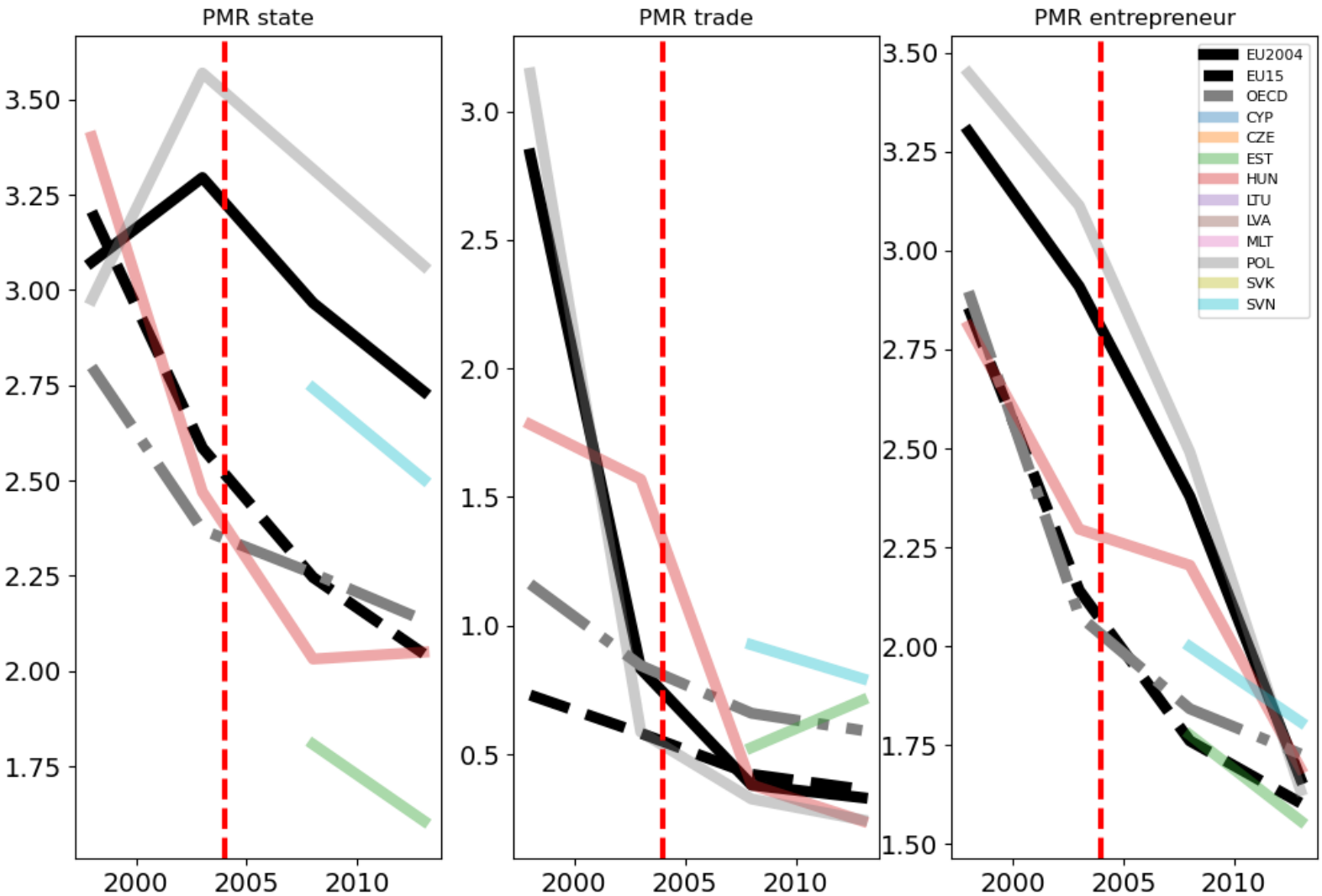


Total Factor Productivity



Regulation: Product Market Regulation

OECD



Misallocation Measurement

CompNet

For each 2-digits industry, CompNet gives firm-level distribution on MRPK, TFPR, Solow Residual, Labor Producvity.

- In each industry*country, normalized standard-deviation by the mean.
- Aggregate at the country-level by weighted average of sector-level variance.
- For EU-2004, weighted average of country-level variance.
- Measure of standard-deviation of MRPK/TFPR/... relative to its industry average.

Misallocation

CompNet

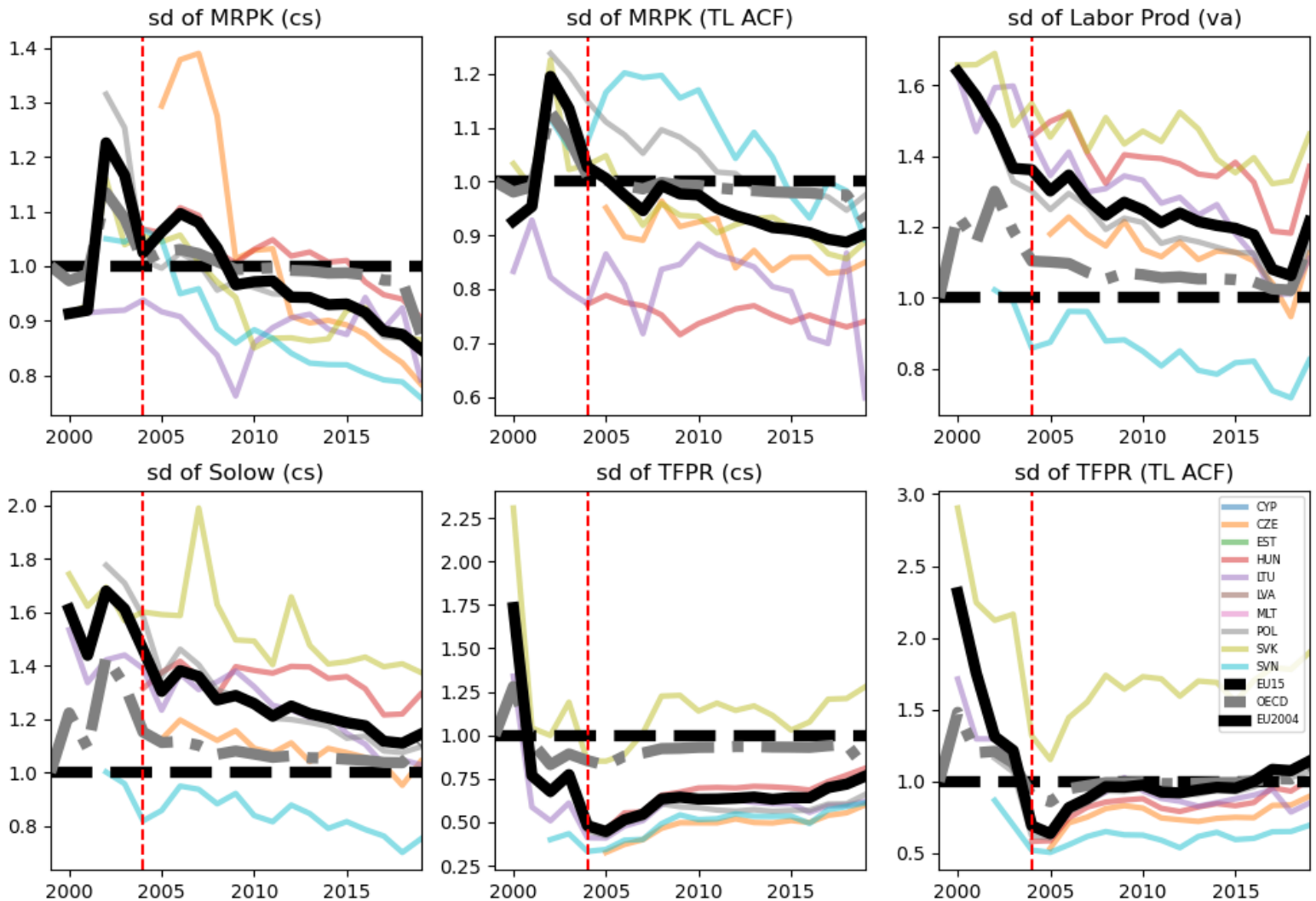


Table of Contents

Neo-Classical Growth Model

- **Households:** consume and save.

$$\max_{\{C_t, K_{t+1}\}} \quad \sum_{t=0}^{\infty} \beta^t \frac{C_t^{1-\gamma}}{1-\gamma}$$
$$\text{subject to:} \quad C_t + K_{t+1} = w_t N_t + r_t K_t + (1-\delta)K_t + T_t$$

- **Firms:** hire labor and rent capital subject to frictions τ_y and τ_k

$$\max_{\{K_t, N_t\}} (1-\tau_y) K_t^{\alpha} (A_t N_t)^{1-\alpha} - w_t N_t - (1+\tau_k) r_t K_t$$

- **Market clears and capital depreciate:**

$$K_{t+1} = I_t + (1-\delta)K_t$$
$$A_t K_t^{\alpha} N_t^{1-\alpha} = C_t + I_t$$

- **TFP** grows from A_0: $A_{t+1} = (1+g)A_t$

First-Order-Conditions

- **Households:** Euler equation

$$\beta \left(\frac{C_{t+1}}{C_t} \right)^{-\gamma} (1 + r_{t+1} - \delta) = 1$$

- **Firms:** marginal revenue product = rates

$$\alpha(1 - \tau_y) A_t^{1-\alpha} K_t^{\alpha-1} N_t^{1-\alpha} = r_t(1 + \tau_k)$$
$$(1 - \alpha)(1 - \tau_y) A_t^{1-\alpha} K_t^{\alpha} N_t^{-\alpha} = w_t$$

- **LoM of capital:**

$$K_{t+1} = K_t^{\alpha} (A_t N_t)^{1-\alpha} - C_t + (1 - \delta) K_t$$

- **TFP** grows from A_0: $A_{t+1} = (1 + g) A_t$

Stationary Equilibrium

with $N_t = 1$ and $\widetilde{X}_t = X_t / A_t$

- **Households:** Euler equation

$$\beta \left(\frac{\widetilde{C}_{t+1}}{\widetilde{C}_t} \right)^{-\gamma} (1 + r_{t+1} - \delta)(1 + g)^{-\gamma} = 1$$

- **Firms:**

$$\alpha(1 - \tau_y)\widetilde{K}_t^{\alpha - 1} = r_t(1 + \tau_k)$$
$$(1 - \alpha)(1 - \tau_y)\widetilde{K}_t^{\alpha} = \widetilde{w}_t$$

- **LoM of capital:**

$$\widetilde{K}_{t+1}(1 + g) = \widetilde{K}_t^{\alpha} - \widetilde{C}_t + (1 - \delta)\widetilde{K}_t$$

- **TFP** grows from A_0: $A_{t+1} = (1 + g)A_t$

Balance Growth Path

with $\forall t, \widetilde{X}_t = \widetilde{X}$

- **Households:** rental rate

$$r = \frac{(1+g)^{\gamma}}{\beta} + \delta - 1$$

- **Firms:** capital and wage rate

$$\widetilde{K} = \left(\frac{r(1+\tau_k)}{\alpha(1-\tau_y)} \right)^{\frac{1}{\alpha-1}}$$

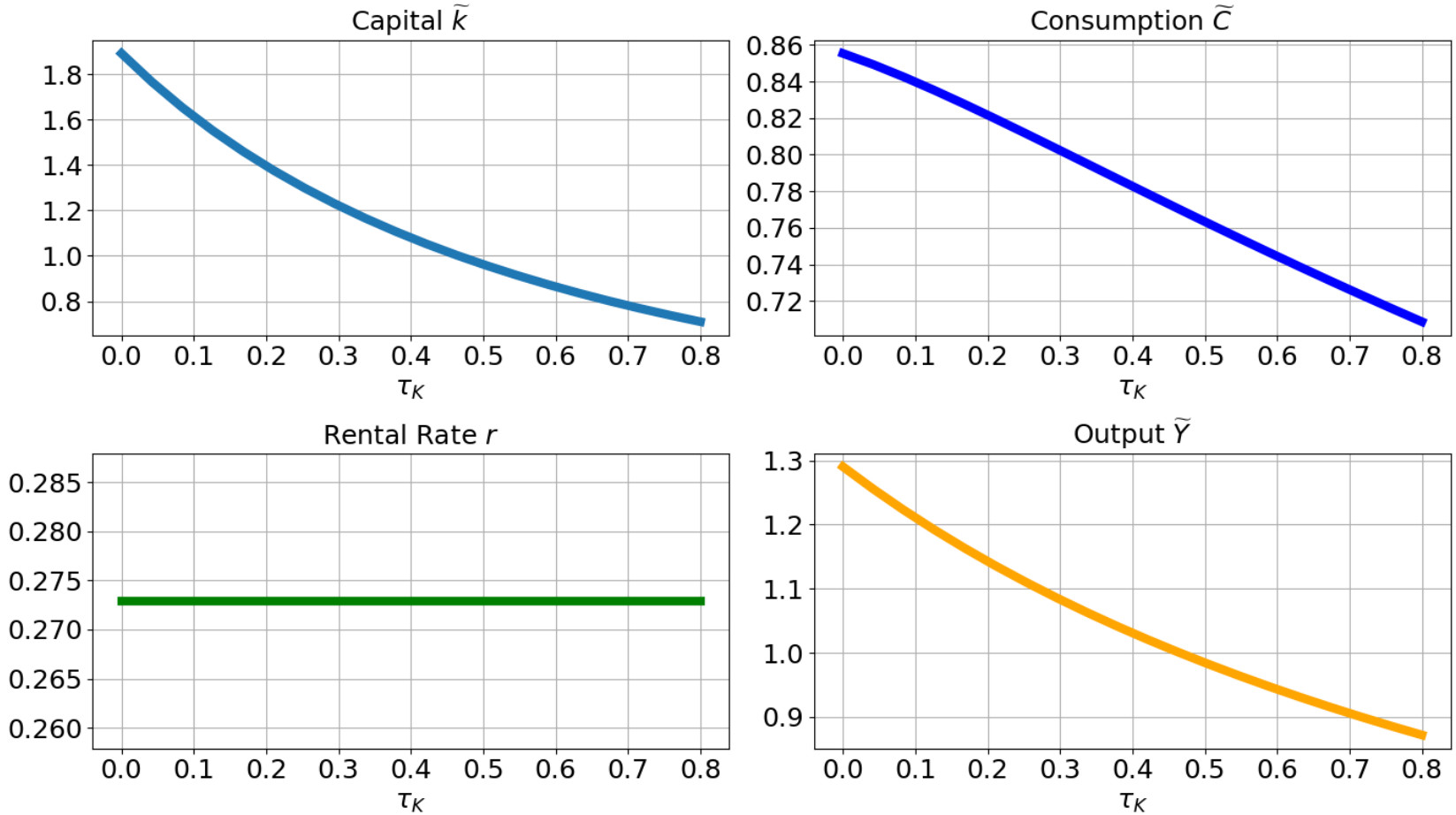
$$\widetilde{w} = (1-\alpha)(1-\tau_y)\widetilde{K}^{\alpha}$$

- **LoM of capital:** consumption

$$\widetilde{C} = \widetilde{K}^{\alpha} - (g+\delta)\widetilde{K}$$

- **TFP** grows from A_0: $A_{t+1} = (1+g)A_t$

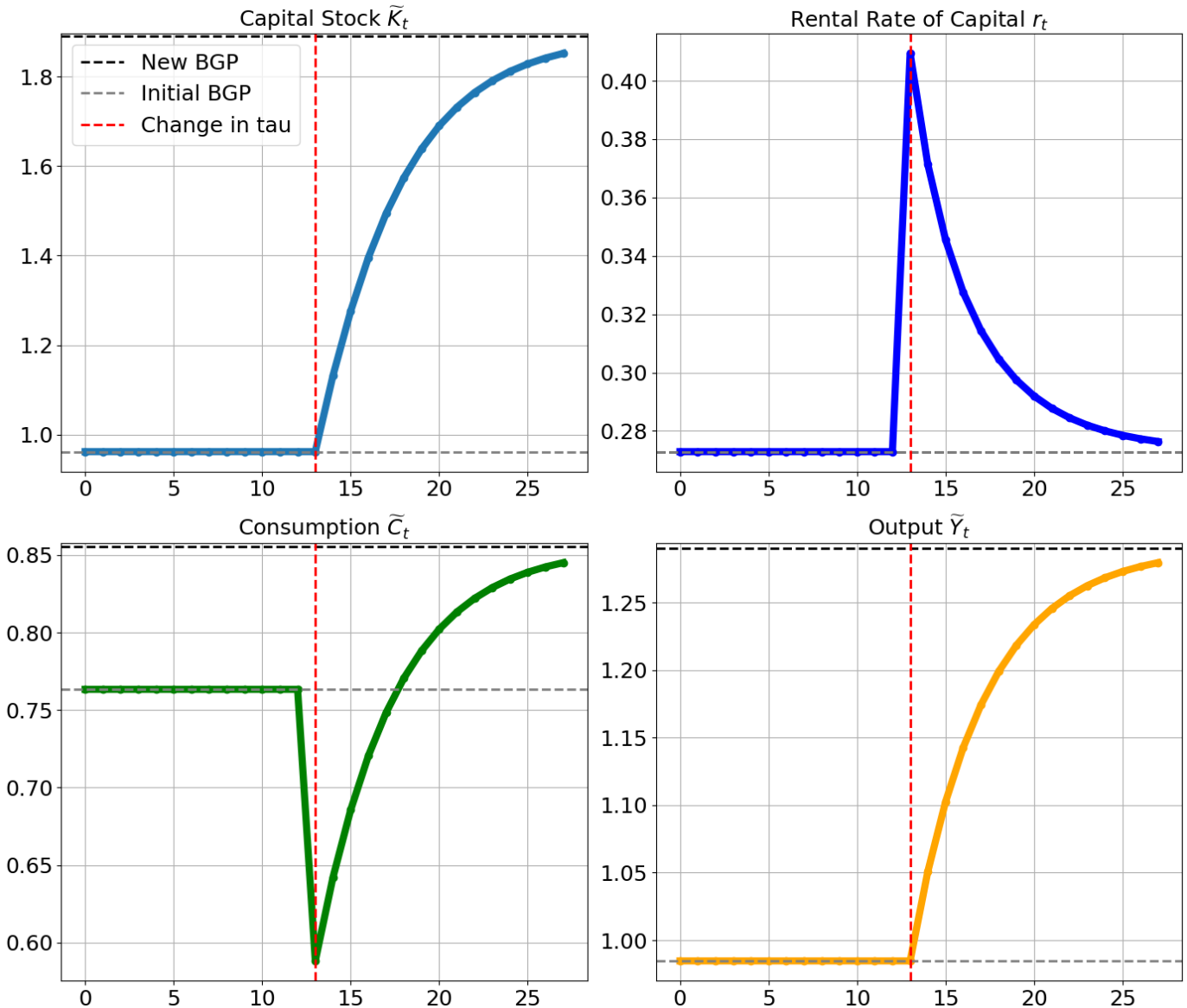
Balance Growth Path and Distortion τ_k



Calibration: $\delta, g, \beta, \alpha = 0.2, 0.03, 0.96, 0.4$

Transition After Unexpected Reform

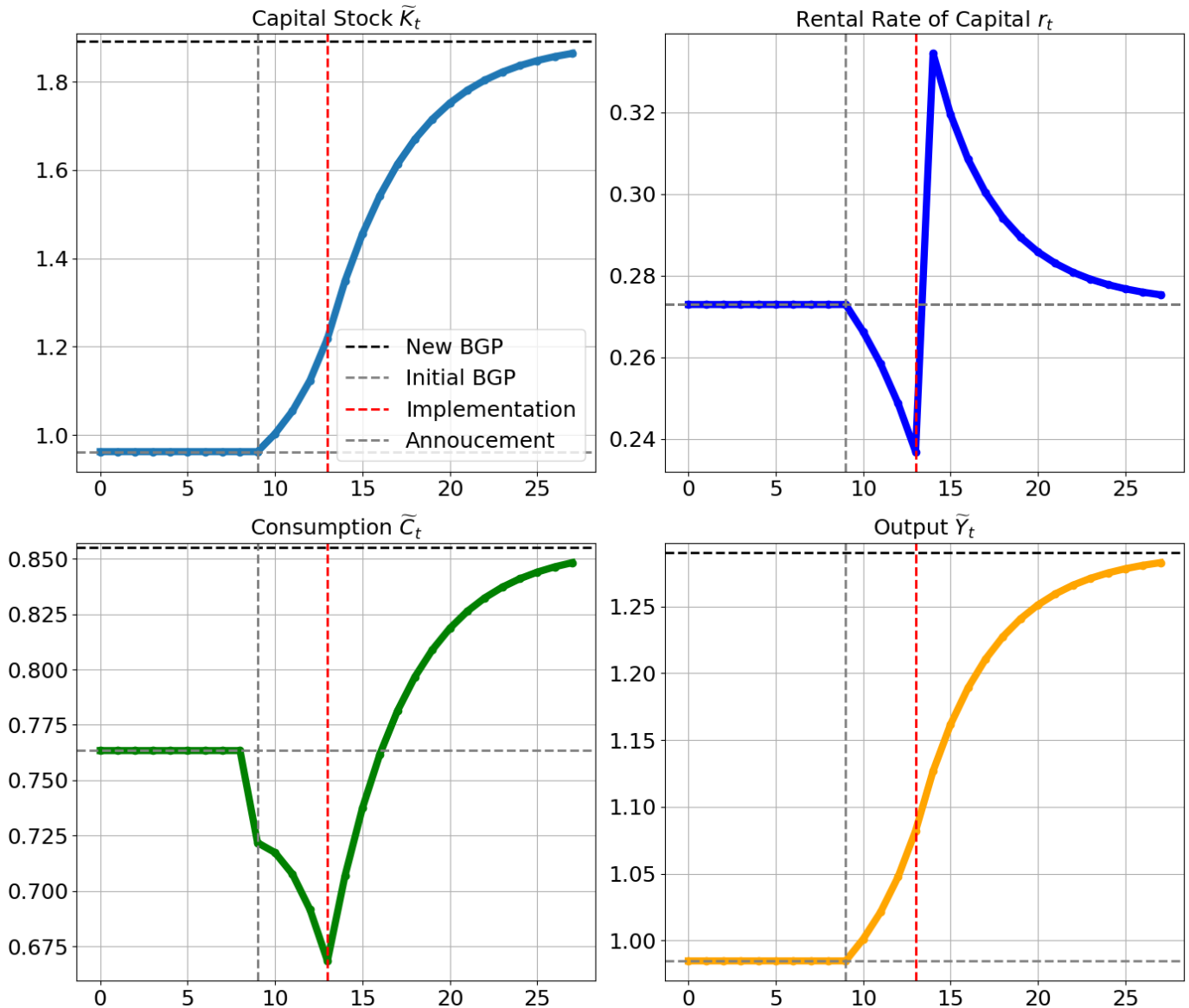
Start at BGP with $\tau_k = 0.5$ then $\tau_k = 0$ at time 13



Calibration: $\delta, g, \beta, \alpha = 0.2, 0.03, 0.96, 0.4$

Transition After Expected Reform

Start at BGP with $\tau_k = 0.5$, annoucement at $t = 9$ of change to $\tau_k = 0$ at time $t = 13$



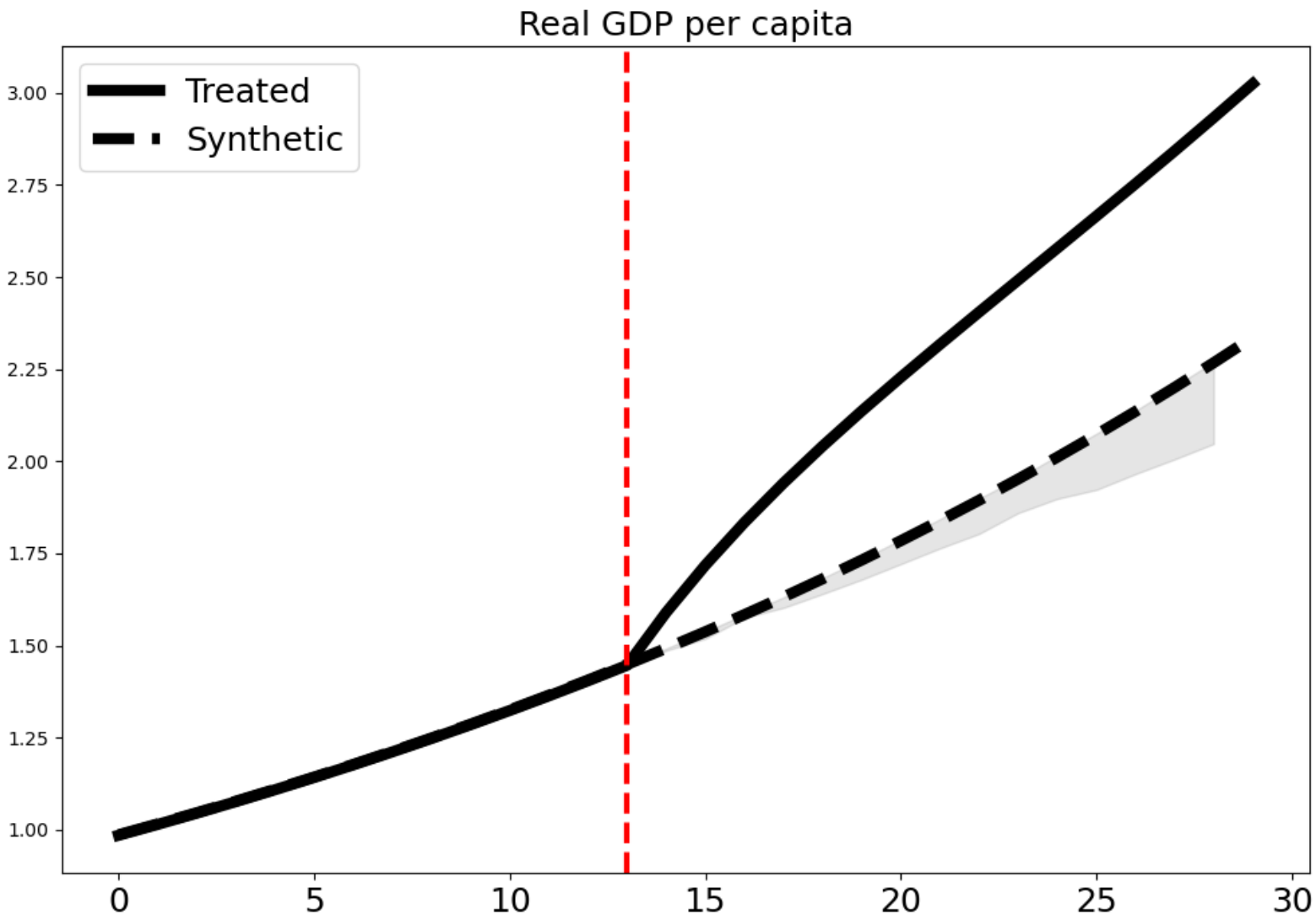
Calibration: $\delta, g, \beta, \alpha = 0.2, 0.03, 0.96, 0.4$

Synthetic Control on Simulated Data

- Simulate output for 1 treated country and 15 untreated countries as in the baseline specs.
- **Treated country**: starts at BGP with $\tau_k = 0.5$ until T_0 and transit to a new BGP with $\tau_k = 0$.
- **Untreated countries**: along their BGP with g and A_0 random.
- Run the synthetic control on the simulated data.

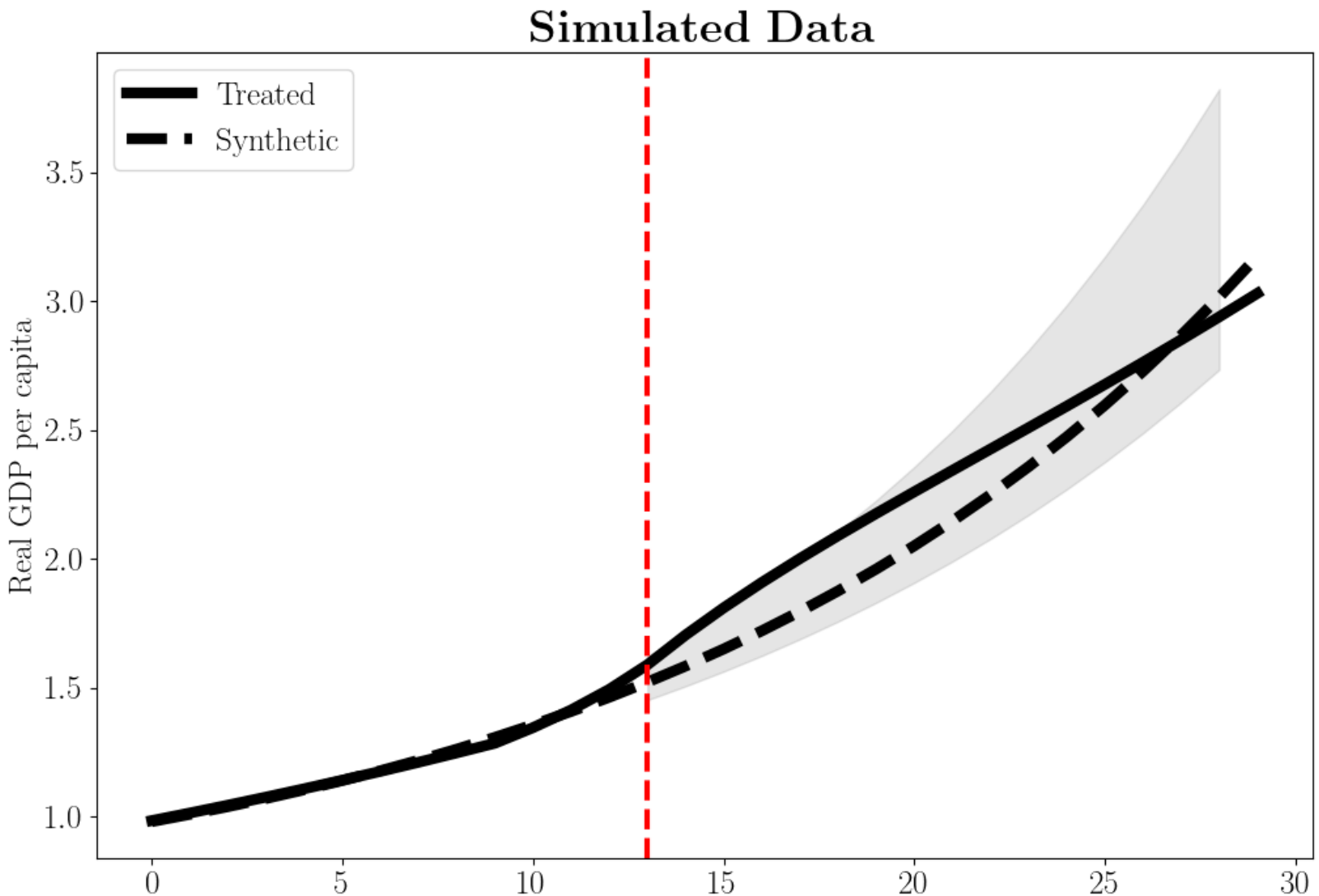
Synthetic Control on Simulated Data

Unexpected treatment



Synthetic Control on Simulated Data

Expected treatment: annoucement 4-periods ahead



Conclusion

- Large gain of joining the EU: 32% higher GDP/capita in 2019.
- About half of the 2004-2019 increase.
- Large positive effect of new membership to the EU without cost to previous members.
- Main aggregate have converge, while TFP is still catching up.
- Mechanism? Evidence of better allocation of factors.
- In 2024, nine countries are currently candidates to join the EU including Ukraine.

Appendix

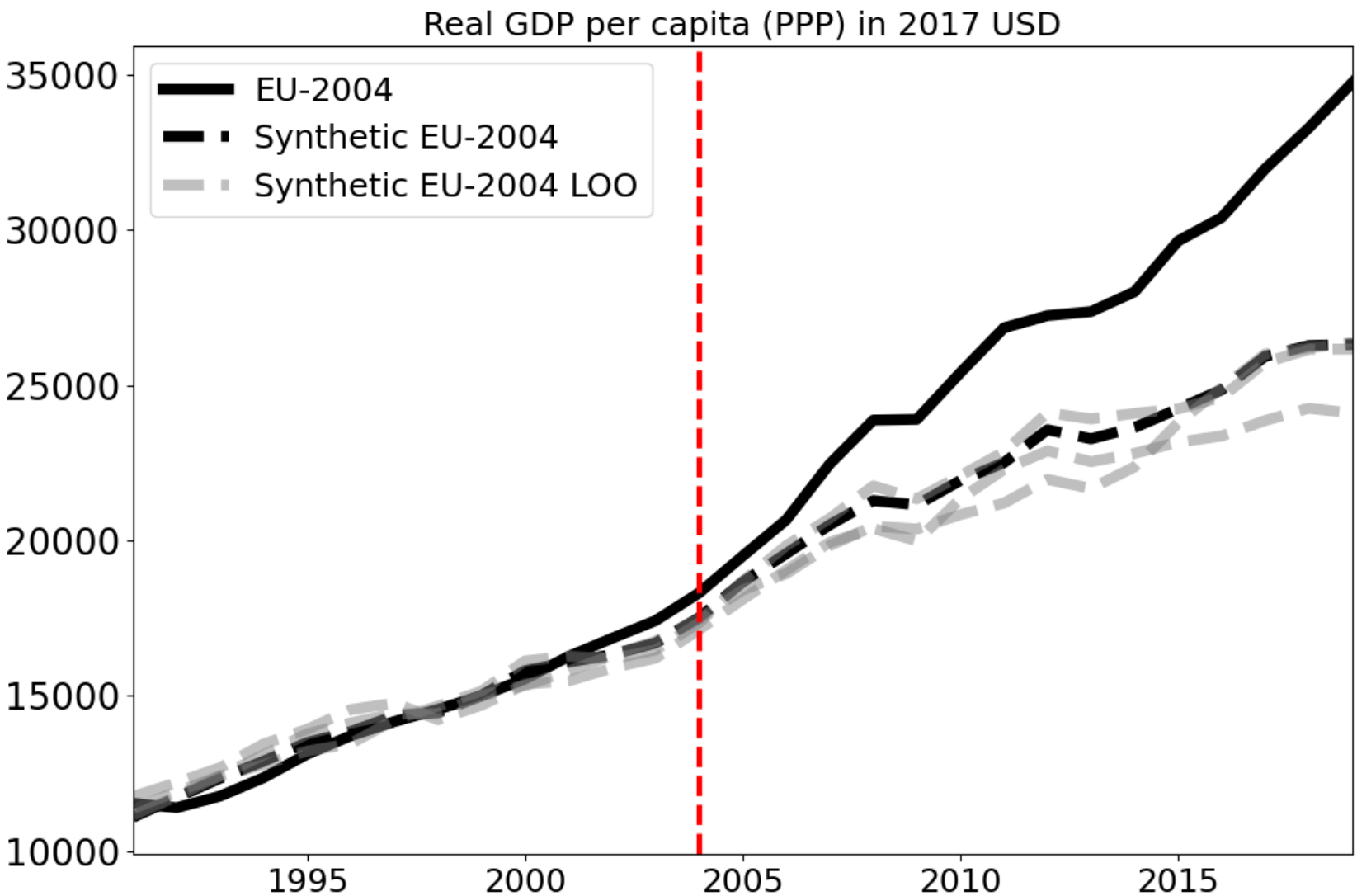
Table of Contents

Leave-One-Out

Back

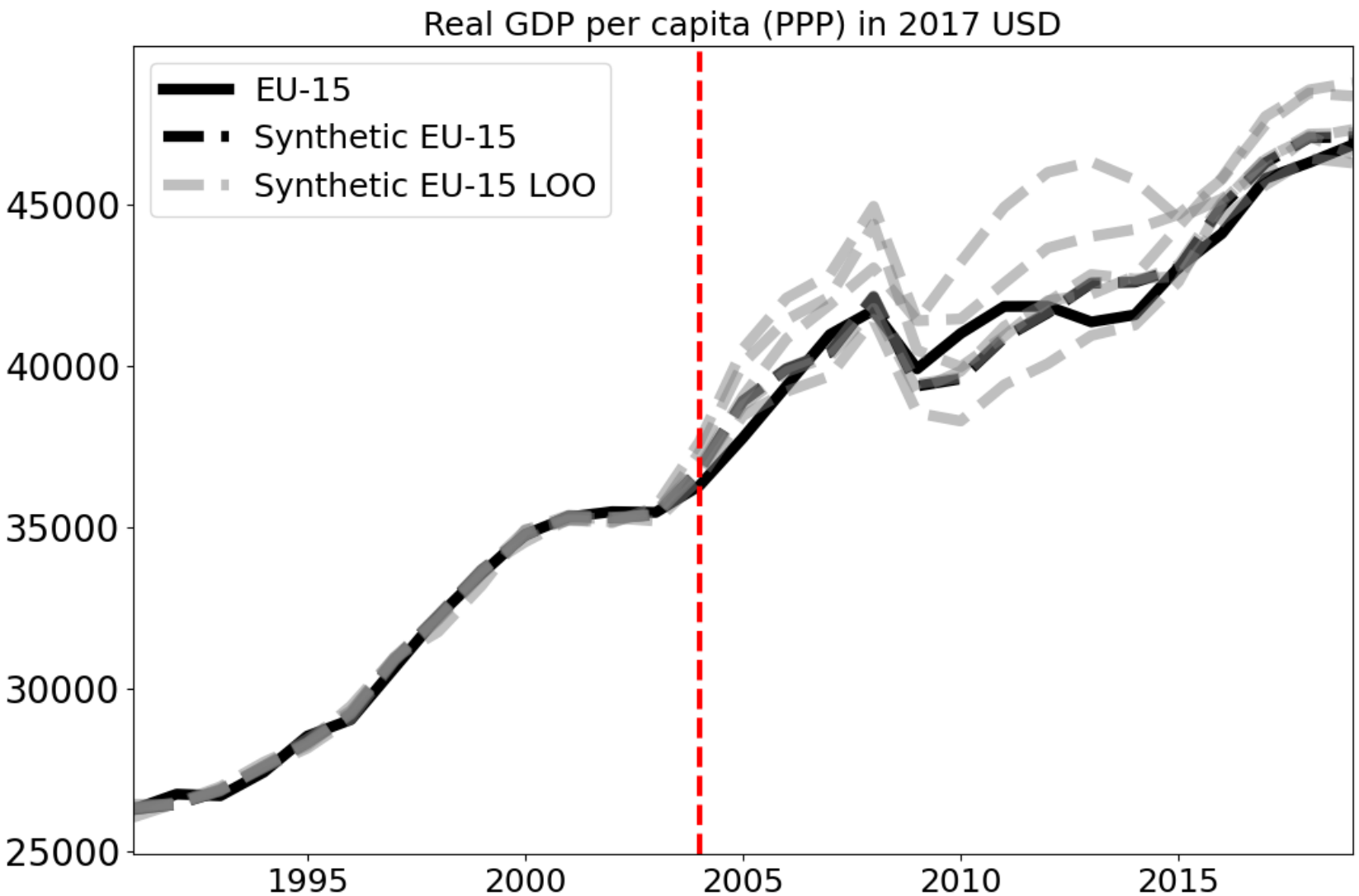
- Remove iteratively countries with non-negative weights from the donor pool.
- Re-compute weights estimation without the country.
- Plot the resulting synthetic control estimator.

Leave-One-Out: EU2004 Back



Leave-One-Out: EU15

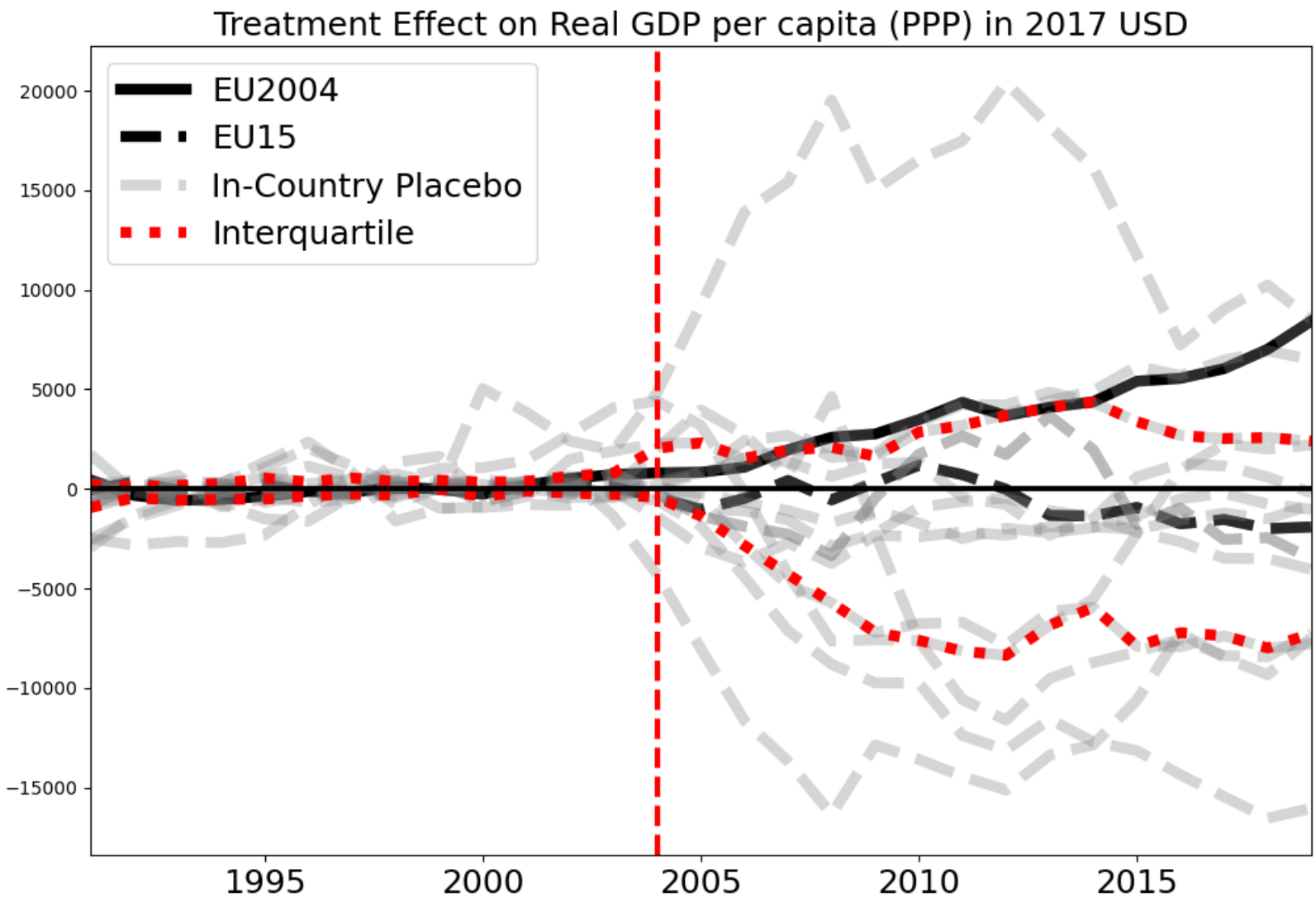
Back



In-Country Placebo Back

- Counterfactually assign the treatment to countries in the donor pool.
- Plot the resulting treatment effect $Y_{t1}(1) - \widehat{Y}_{t1}(0)$.
- Evaluate the treatment vis-à-vis the distribution of placebo treatment.

In-Country Placebo: Back

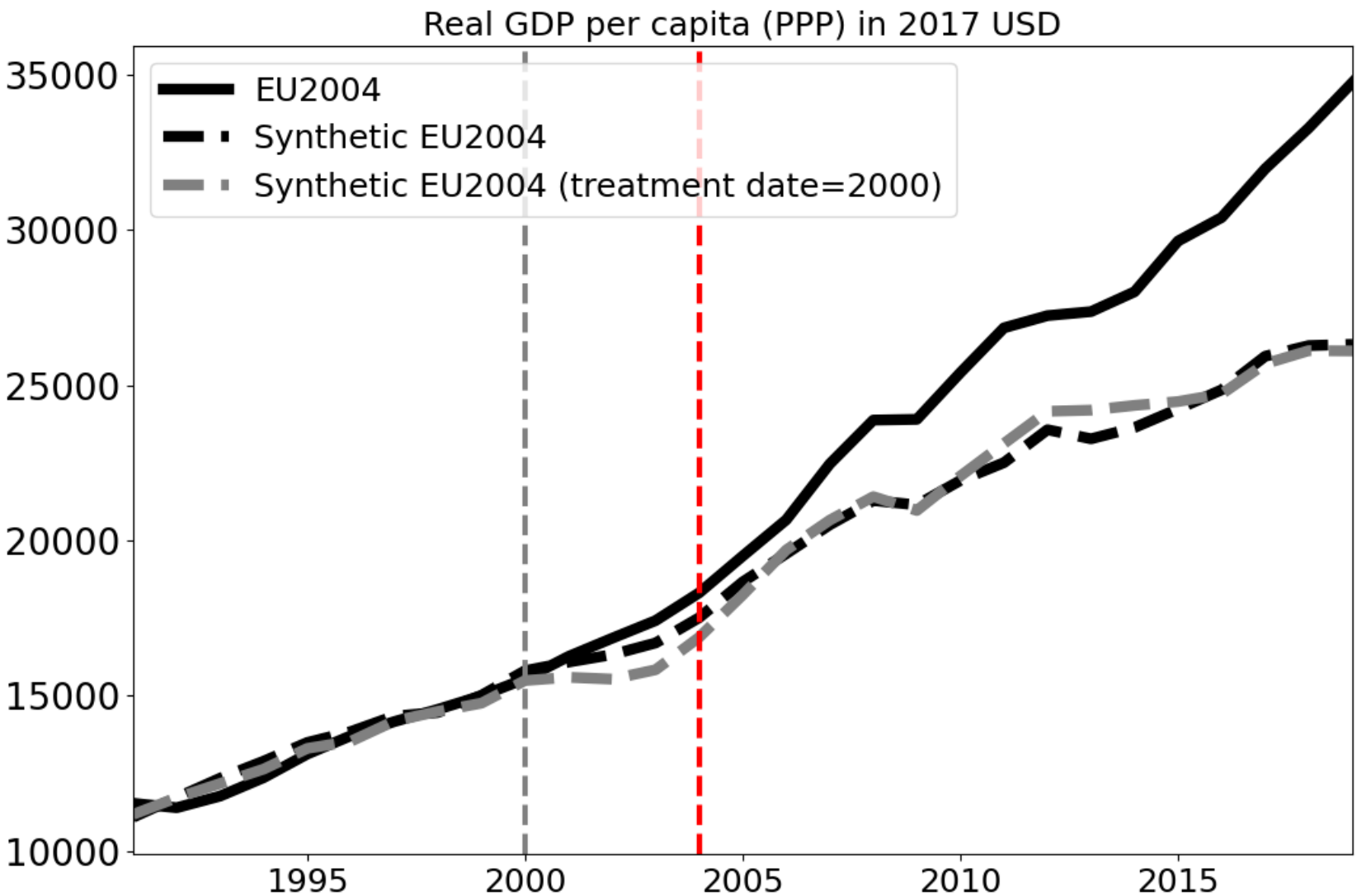


In-Time Placebo

Back

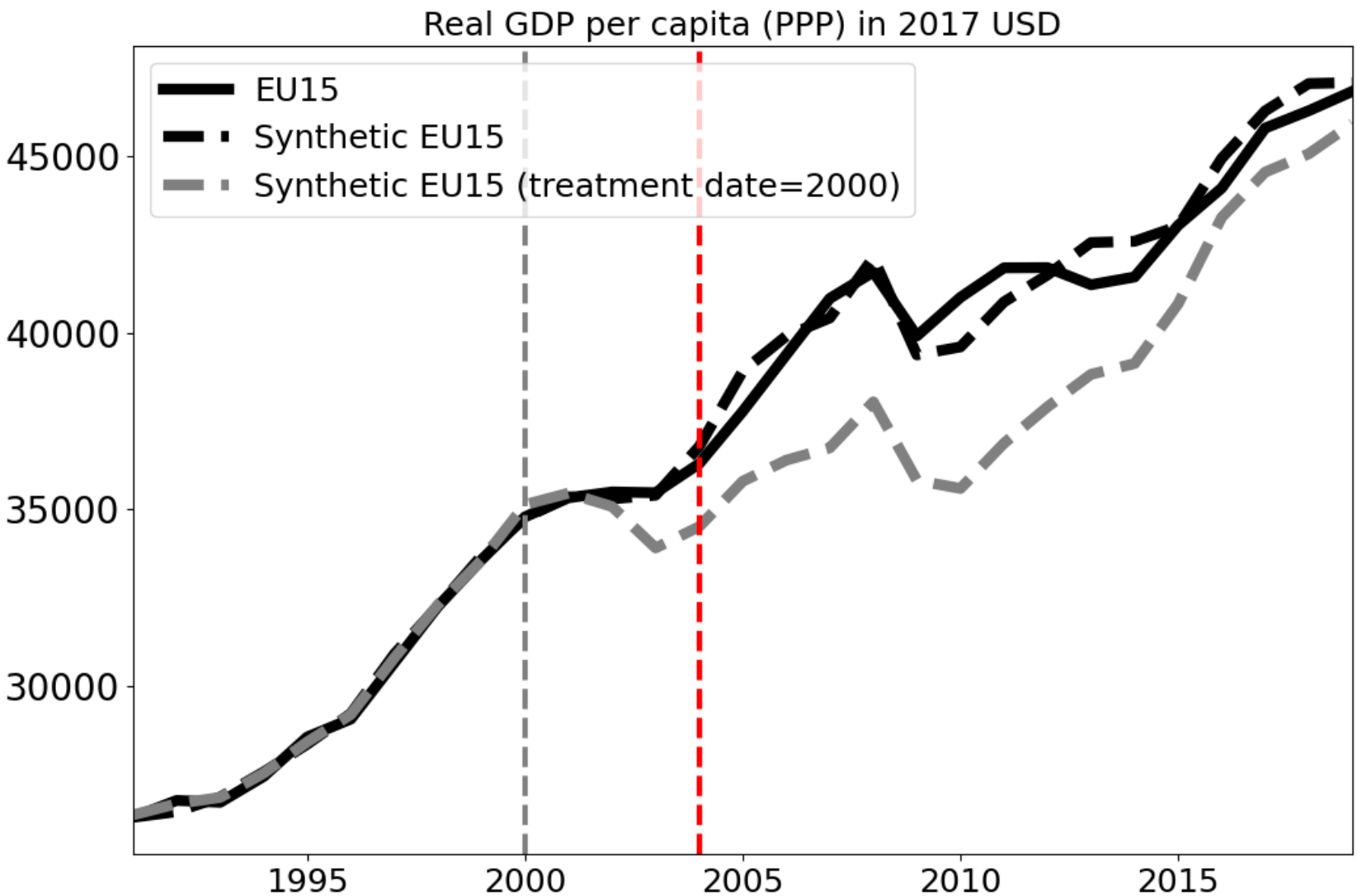
- Assign a counterfactual treatment date: 2000 instead of 2004.
- Assess if the results holds with this new dates.

In-Time Placebo: EU2004 Back



In-Time Placebo: EU15

Back

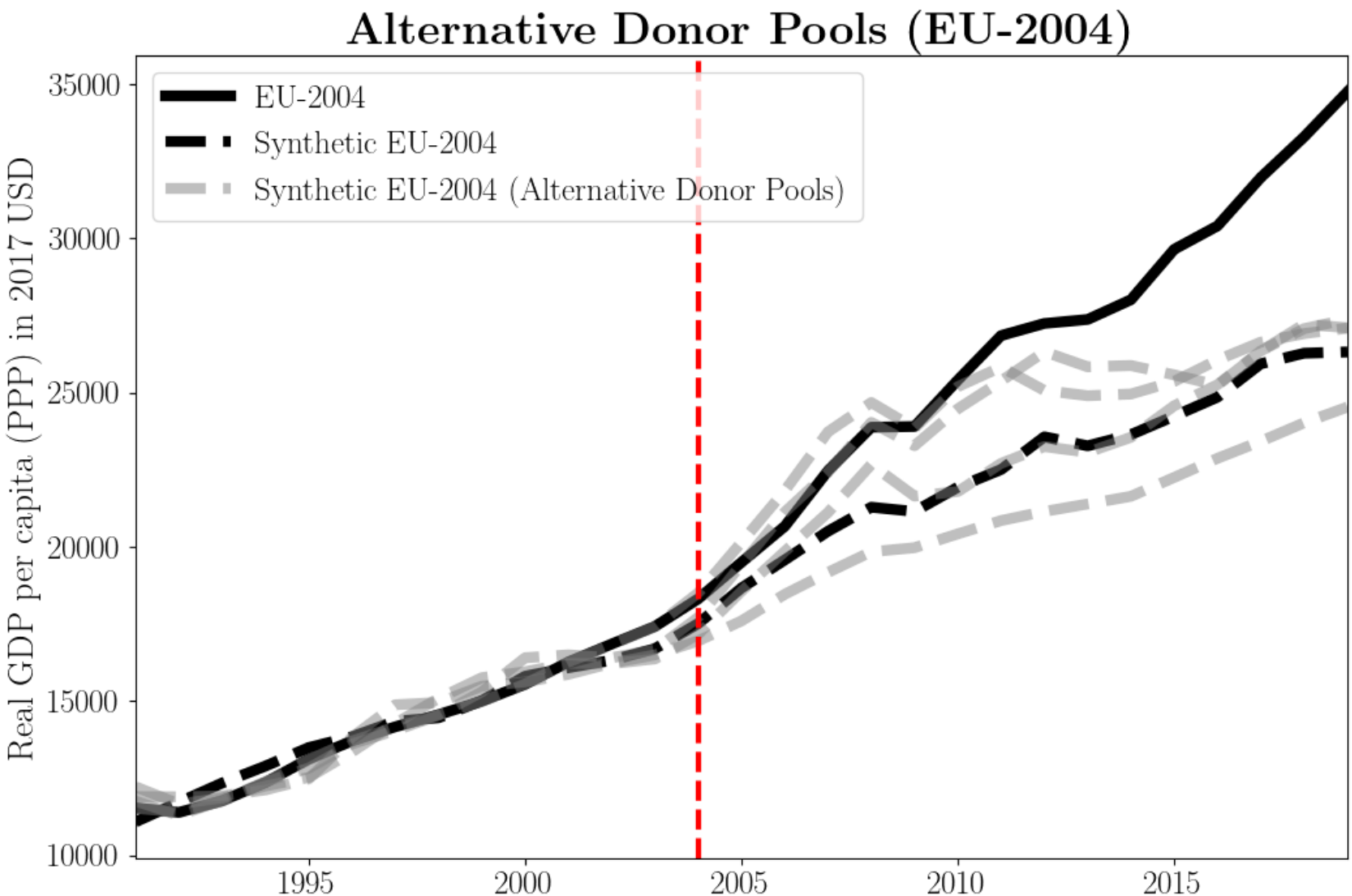


Alternative Donor Pool Back

- Choose an alternative donor countries pool.
- Baseline: OECD countries that never joined the EU
- Alternatives:
  1. Geographical Europe that never joined the EU (robust to Norway),
  2. Above median GDP per capita over the period 1991-2019,
  3. Ex-Communist countries/non-EU G20 countries

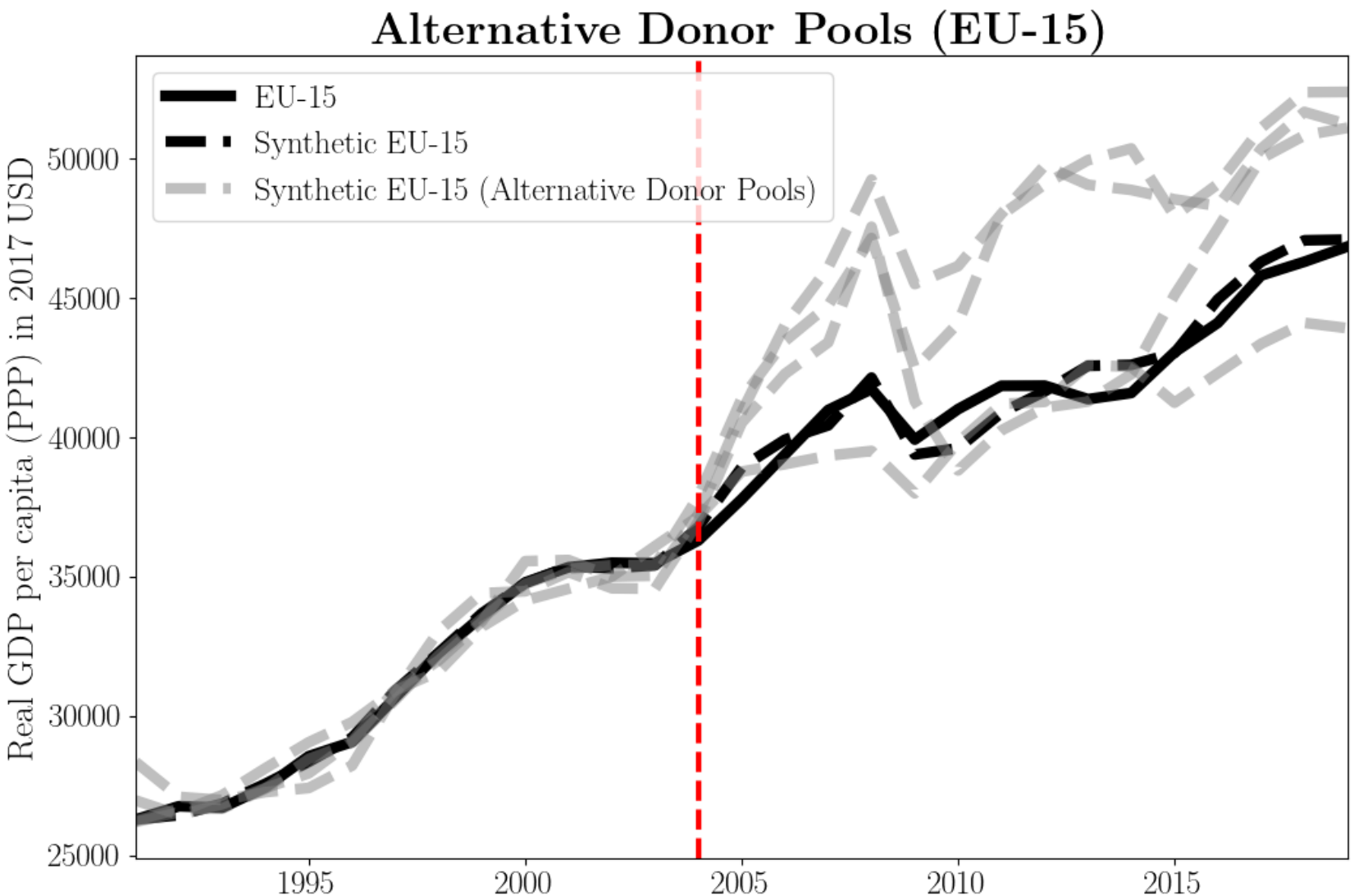
Alternative Donor Pool: EU2004

Back



Alternative Donor Pool: EU15

Back

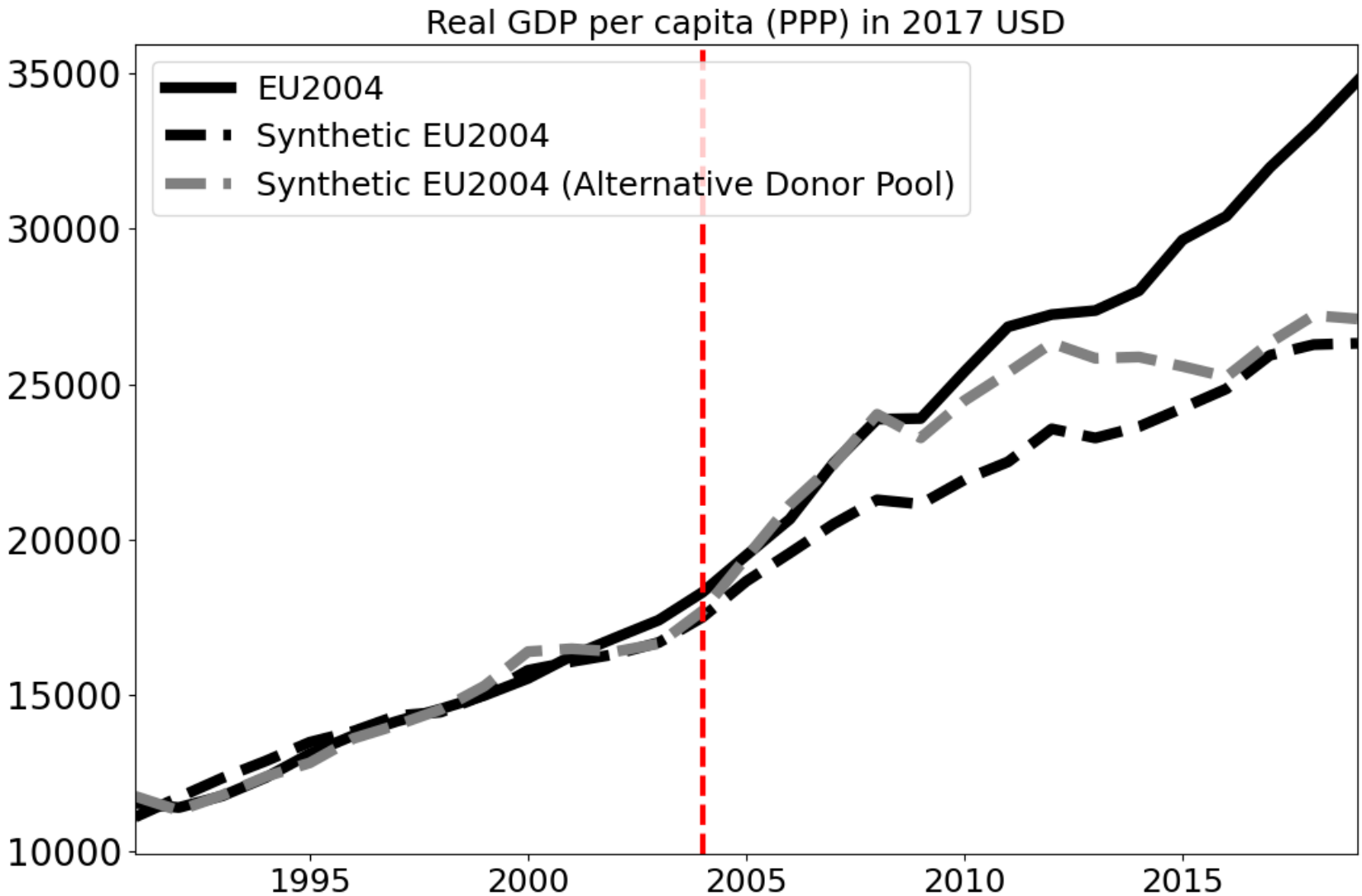


Alternative Donor Pool: EU2004

Back

Geographical Europe that never joined the EU

w/t Norway

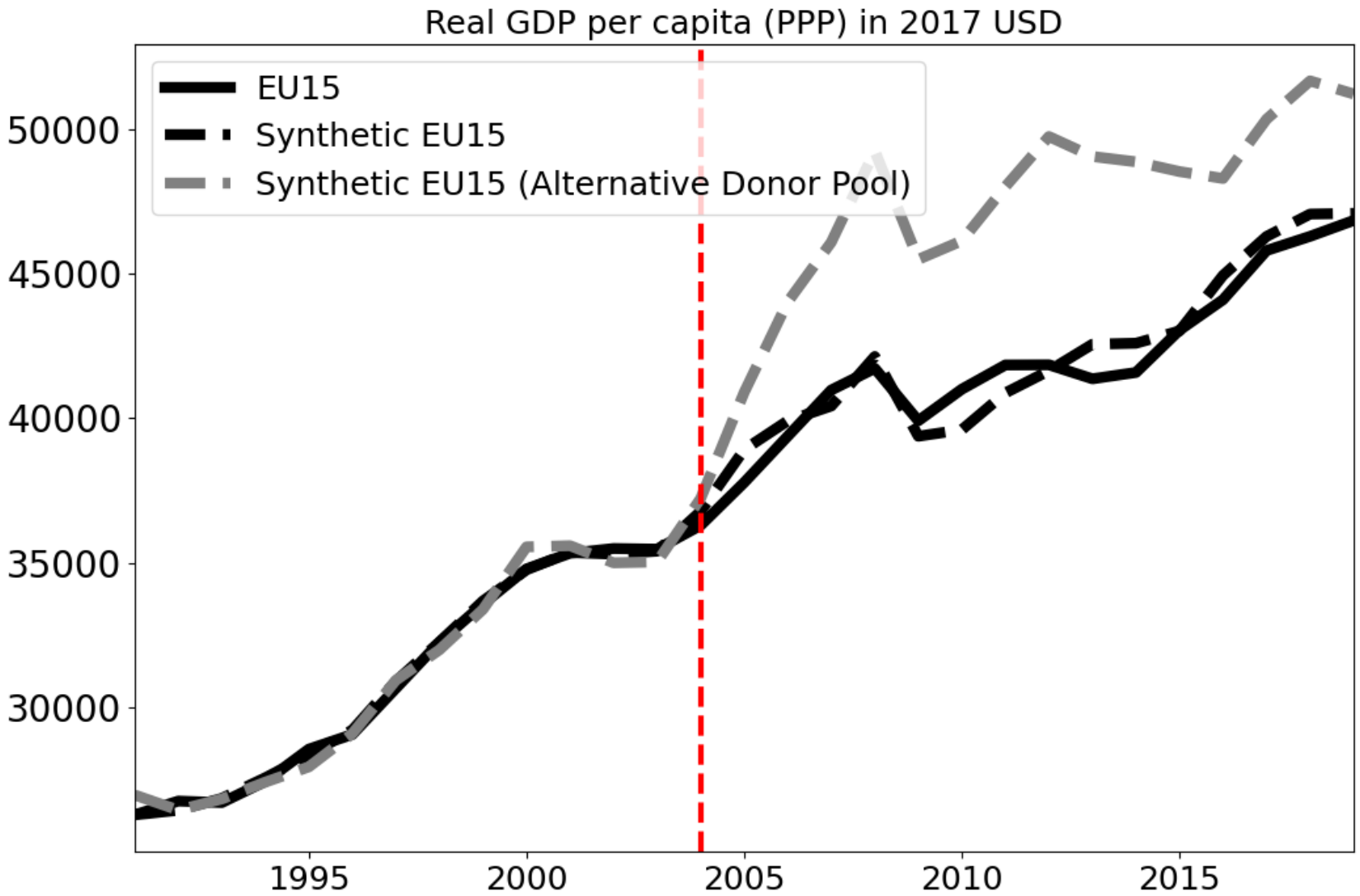


Alternative Donor Pool: EU15

Back

Geographical Europe that never joined the EU

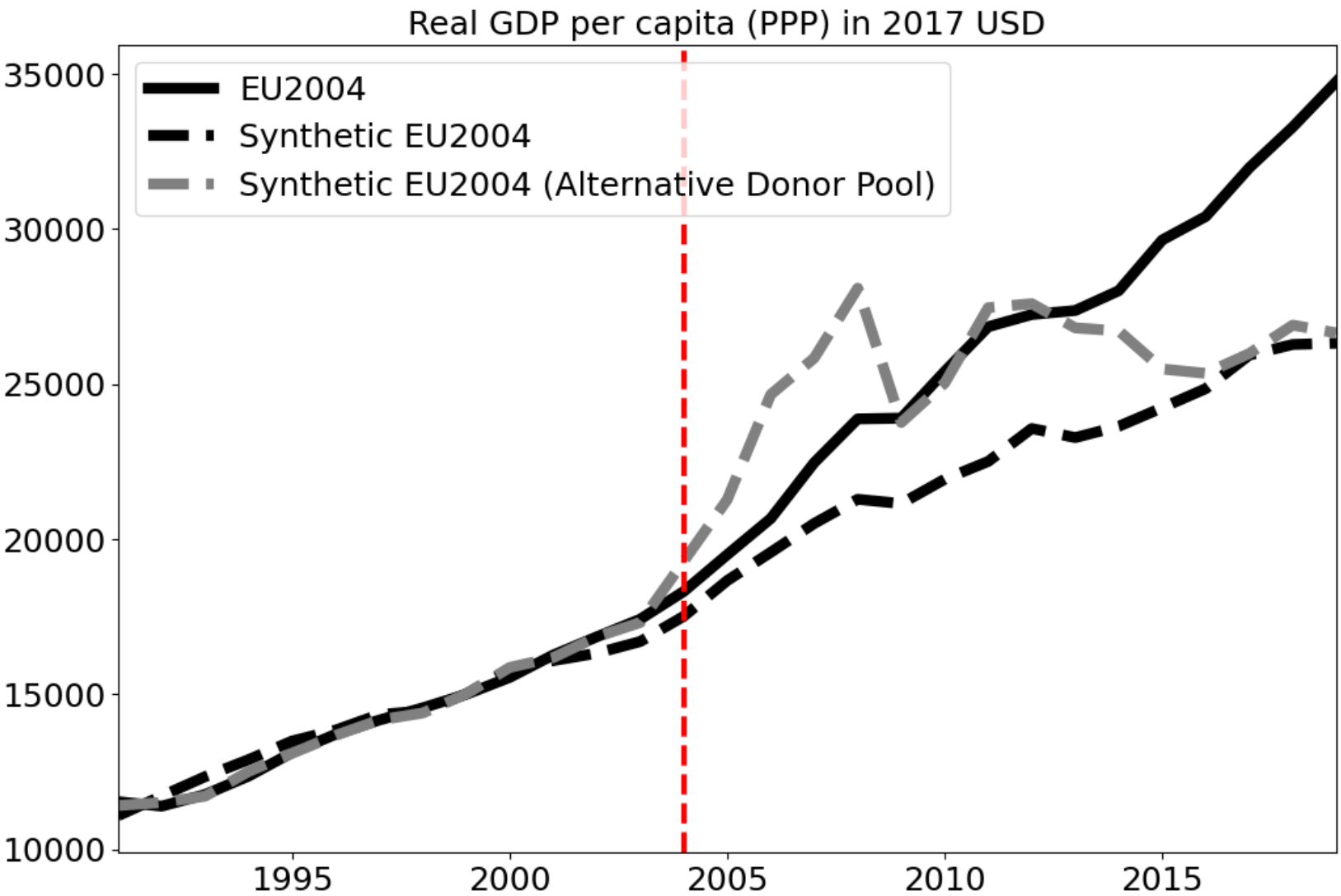
w/t Norway



Alternative Donor Pool: EU2004

Back

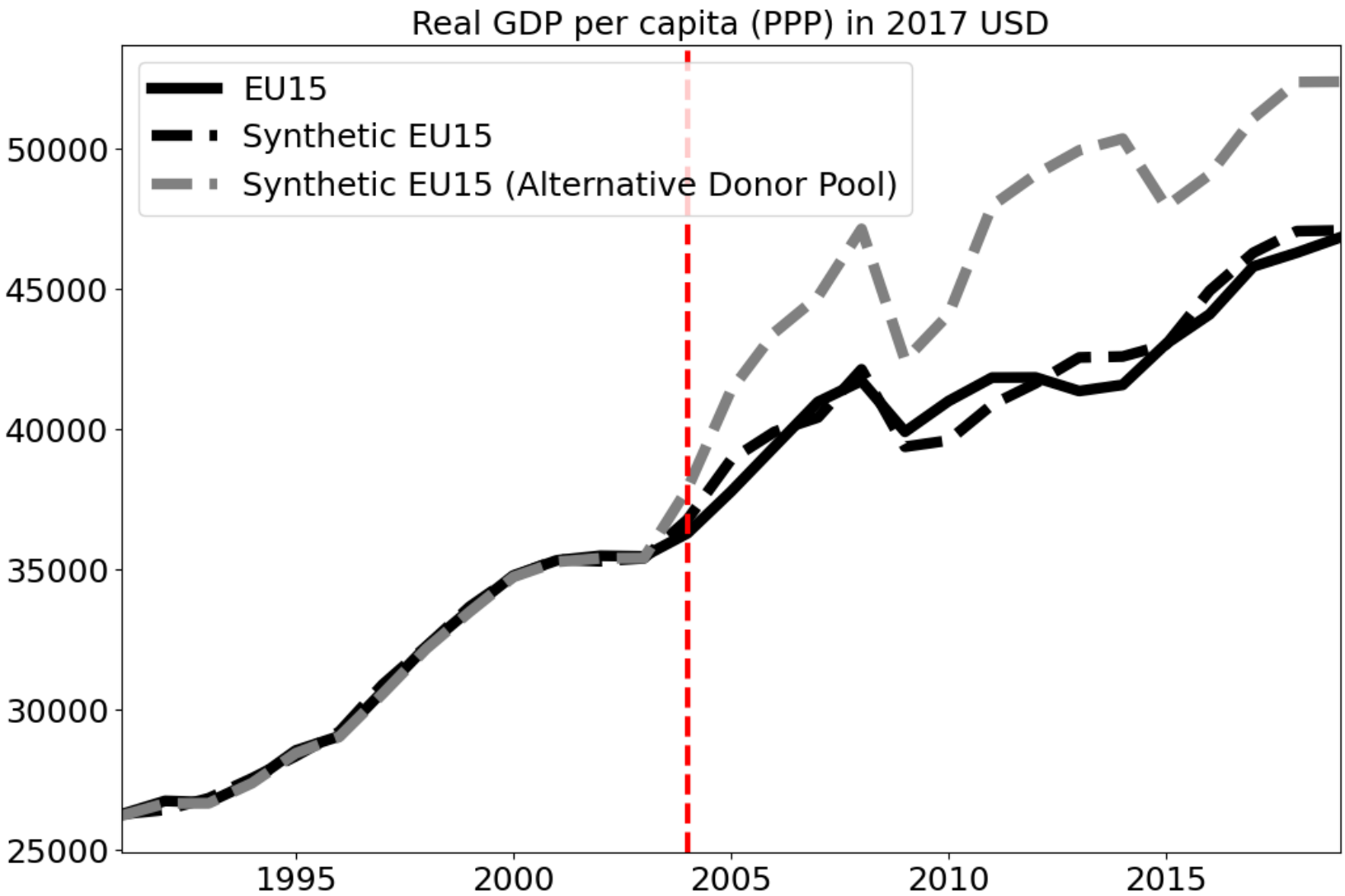
Above median GDP per capita



Alternative Donor Pool: EU15

Back

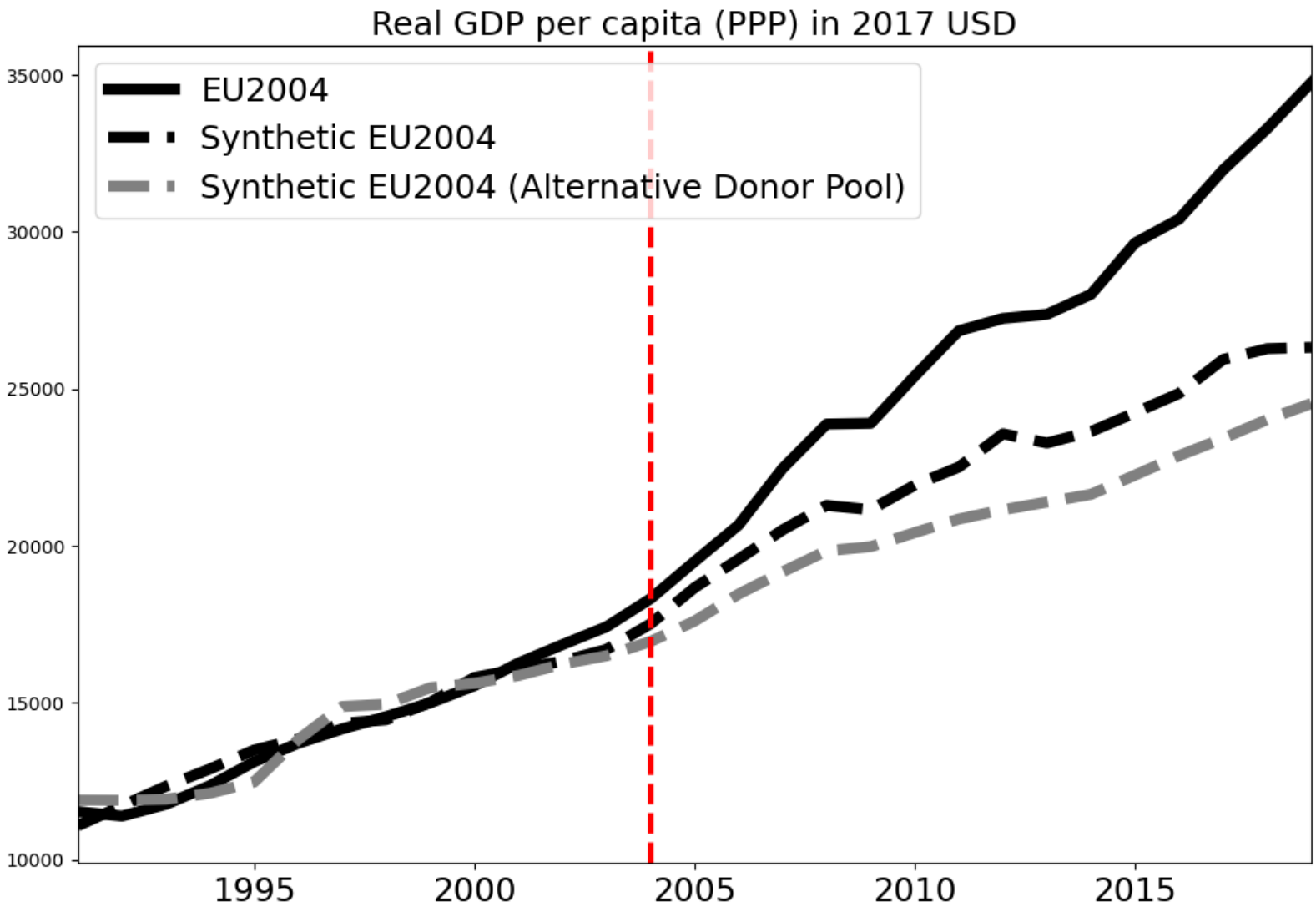
Above median GDP per capita



Alternative Donor Pool: EU2004

Back

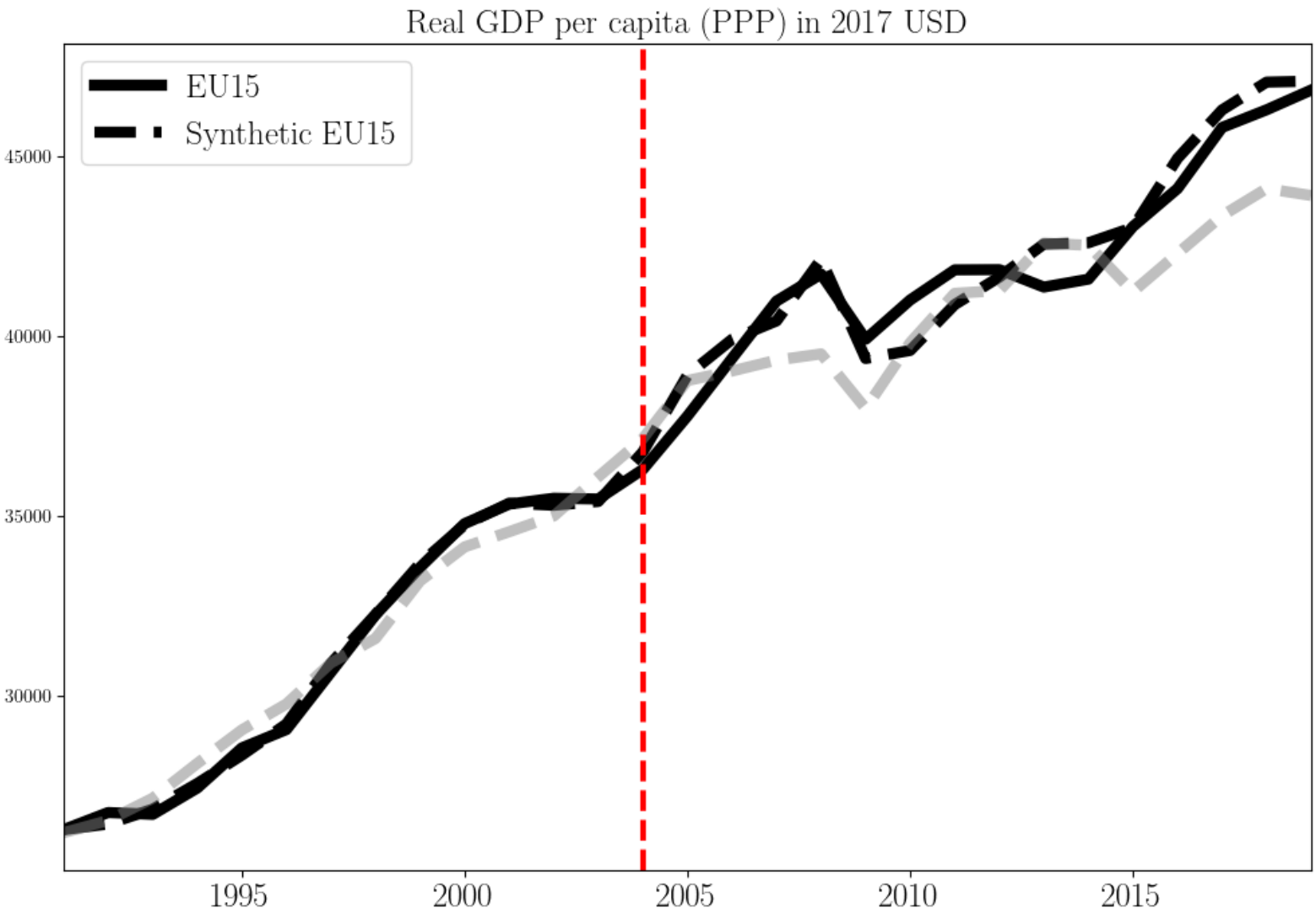
Ex-Communist Countries



Alternative Donor Pool: EU15

Back

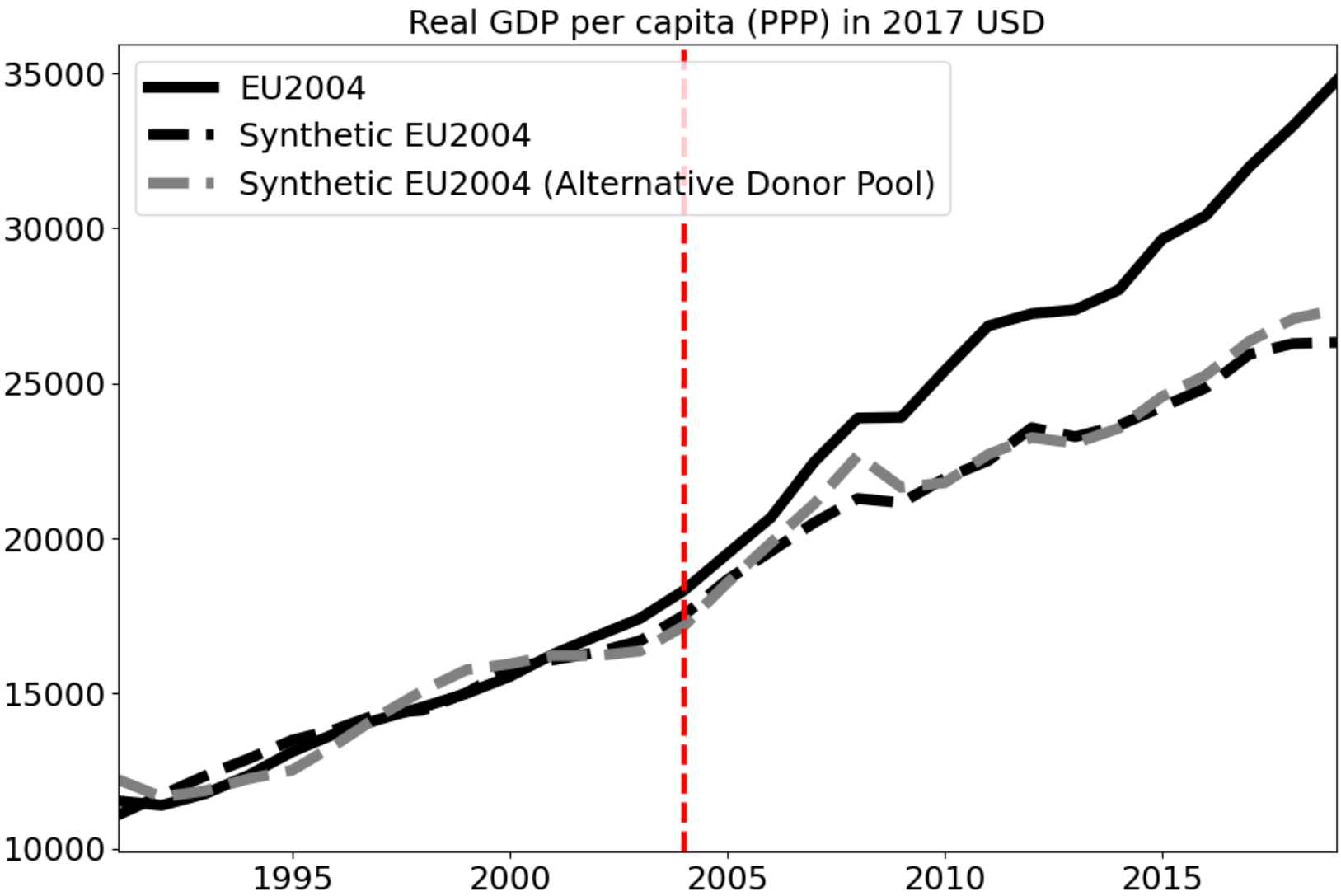
Non-EU G20 countries



Alternative Donor Pool: EU2004

Geographical Europe (without Norway)

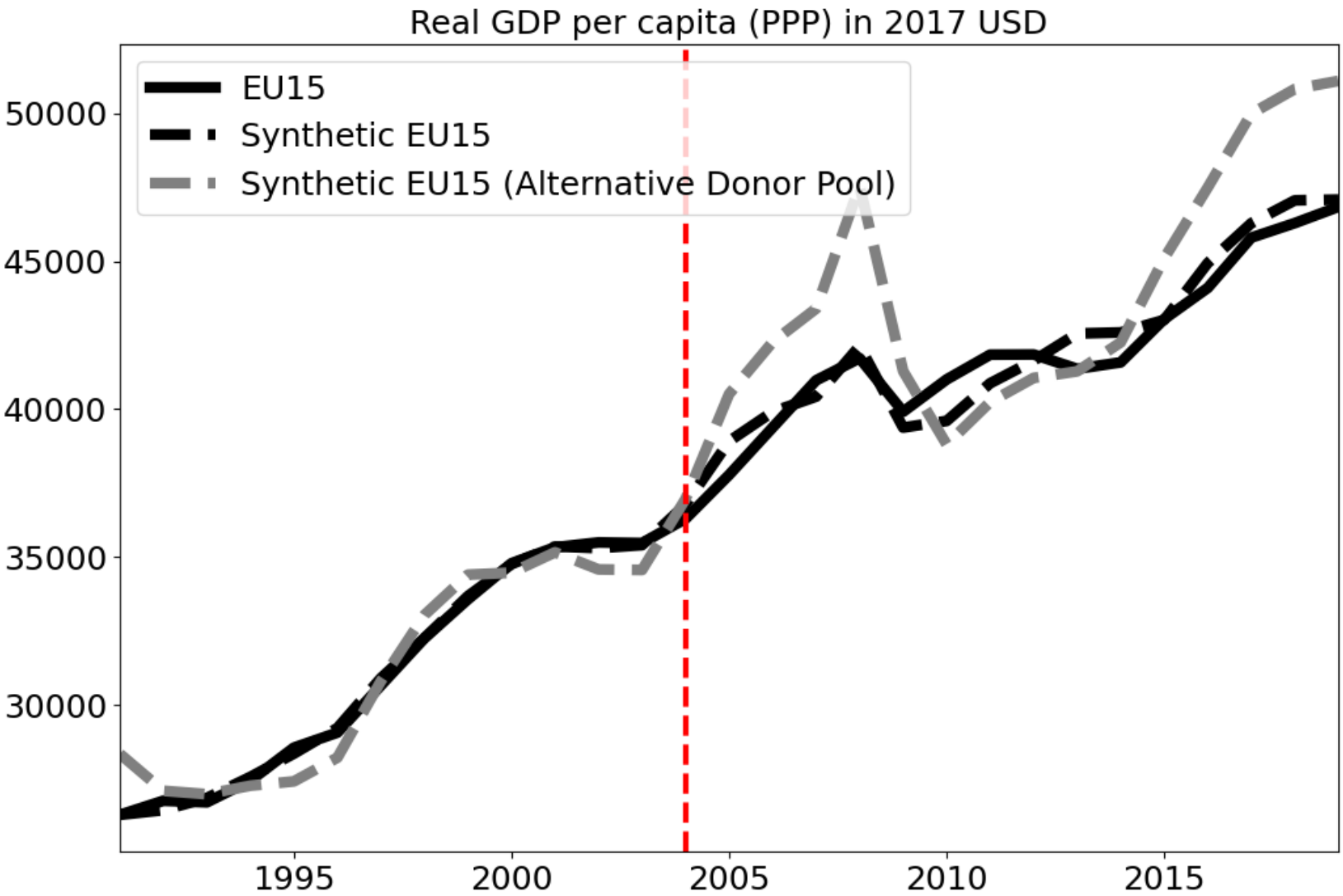
Back



Alternative Donor Pool: EU15

Geographical Europe (without Norway)

Back



Brexit Effect

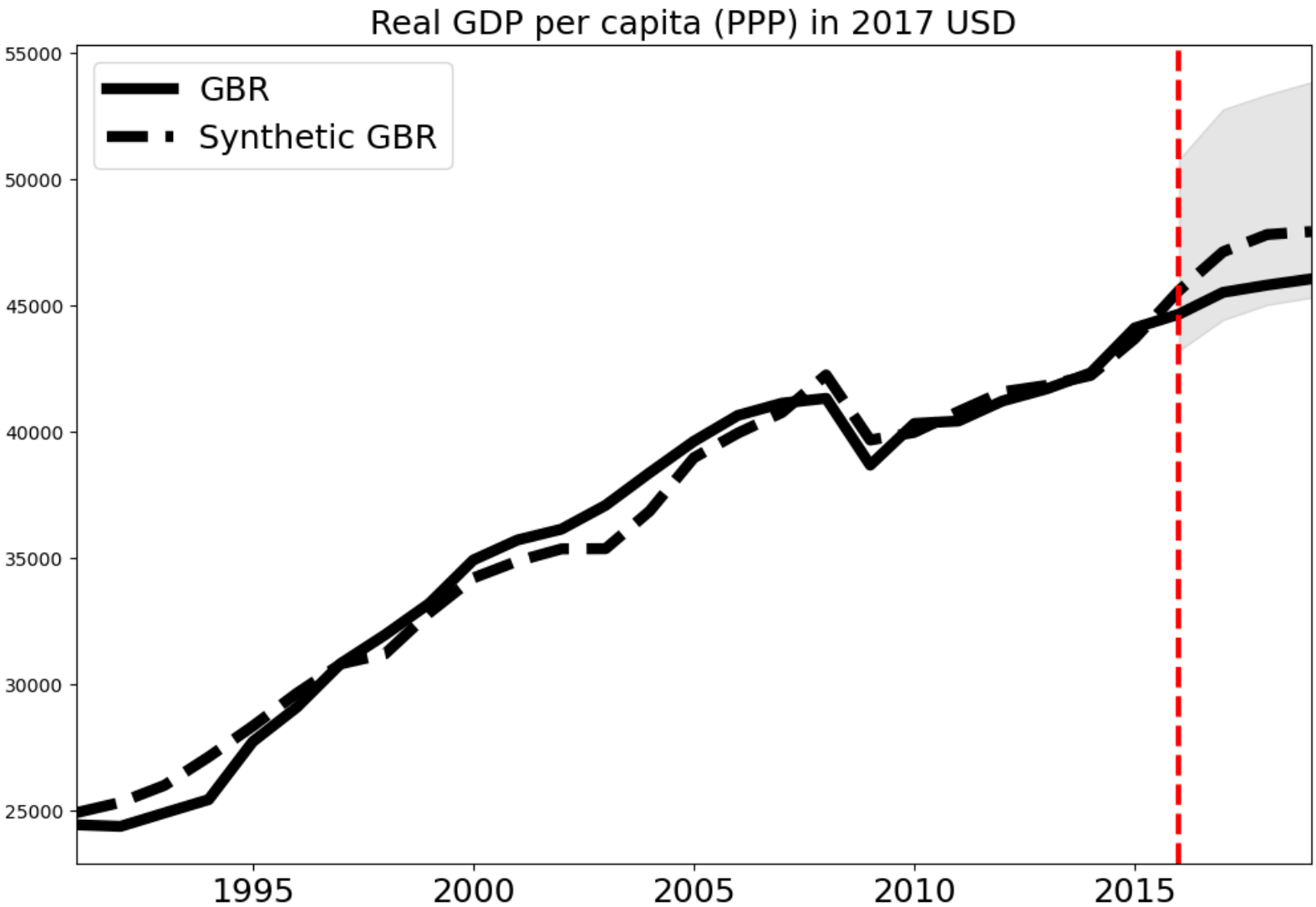
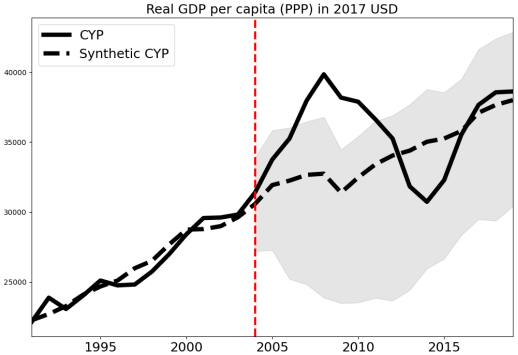
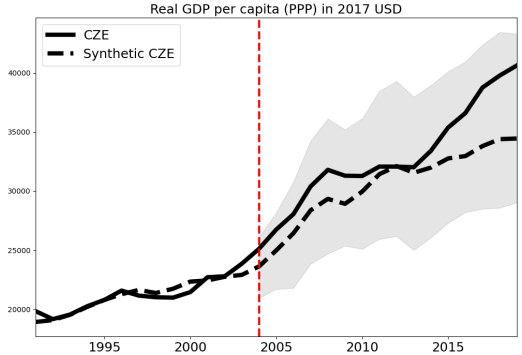


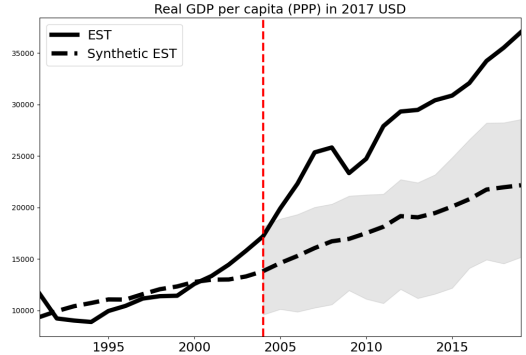
Table of Contents

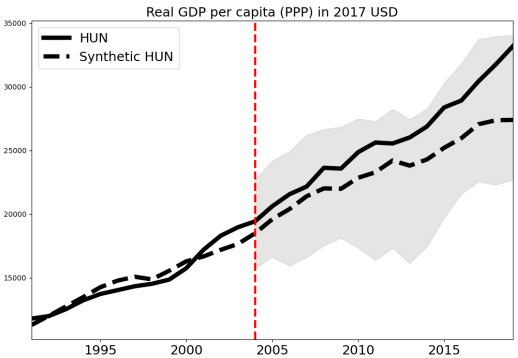
Individual Countries: EU-2004

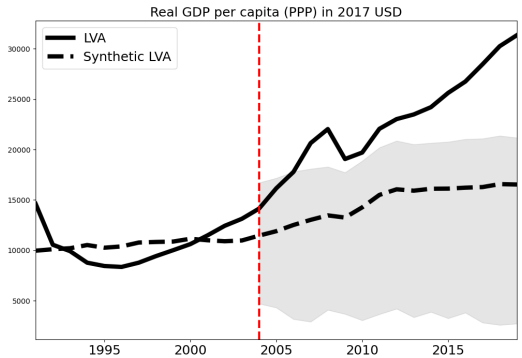
Back EU-2004 Back

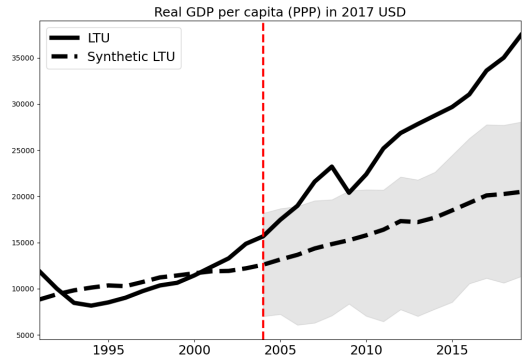


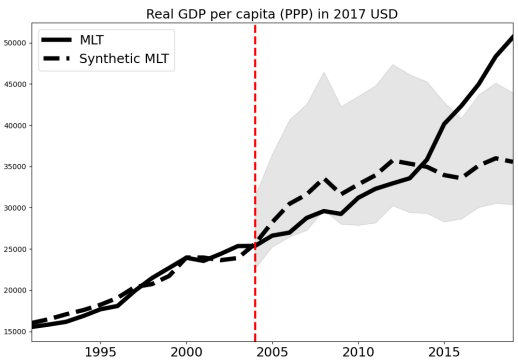


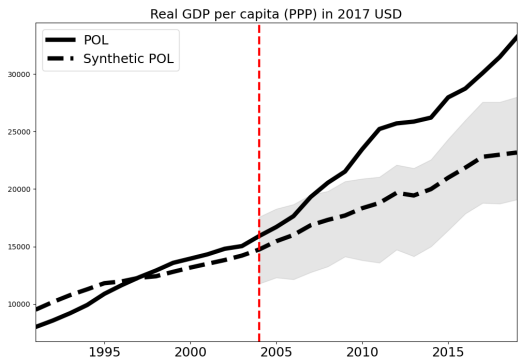


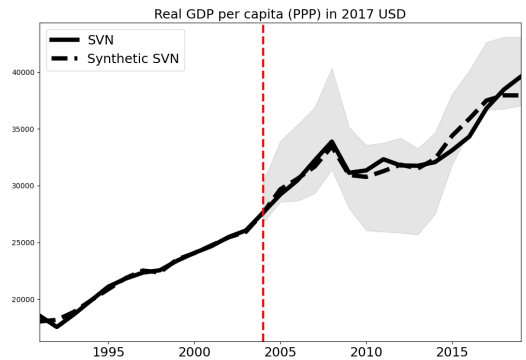






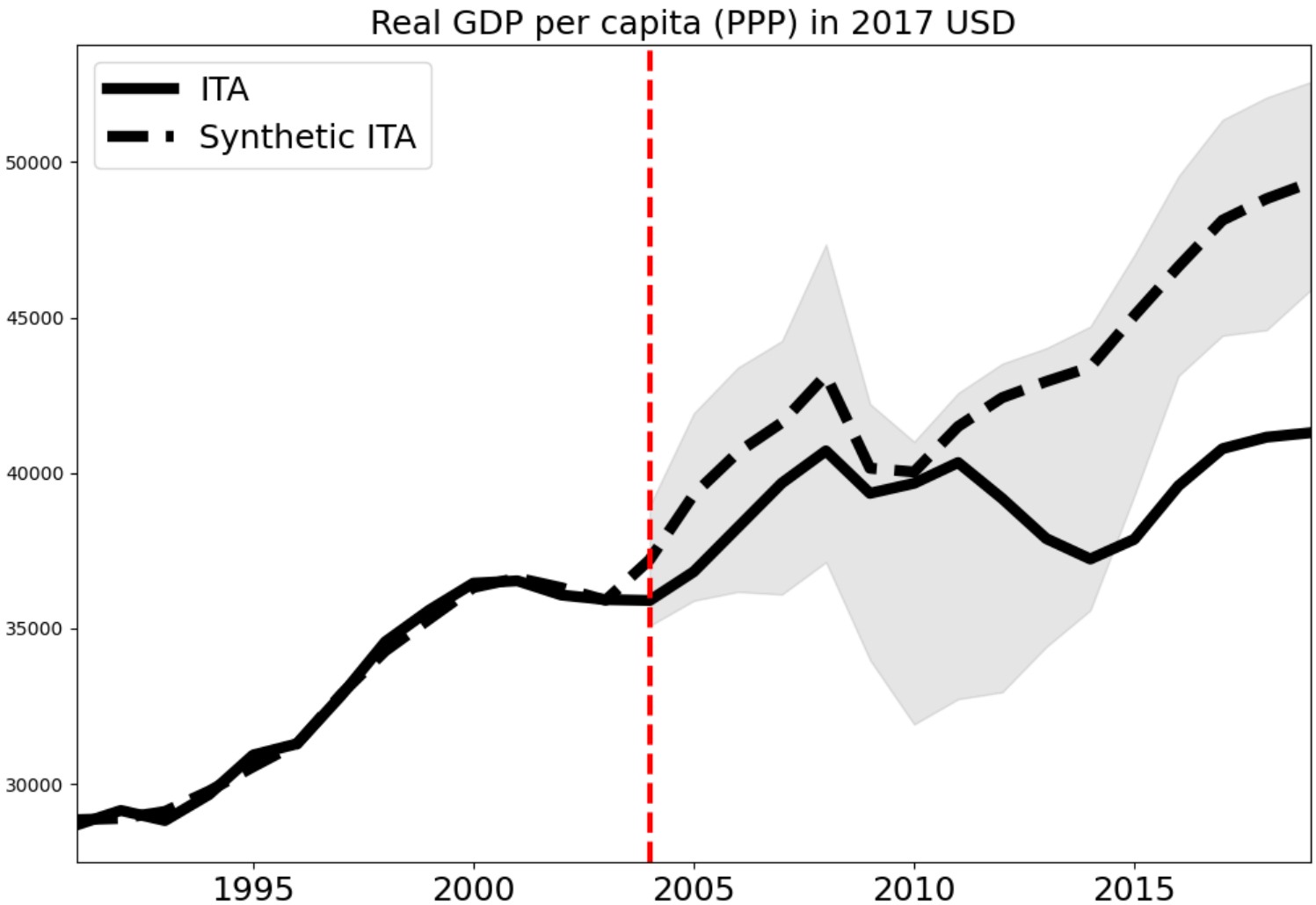






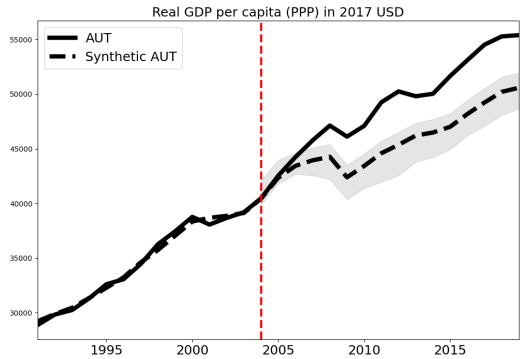
Individual Countries: EU-2004 Cont.

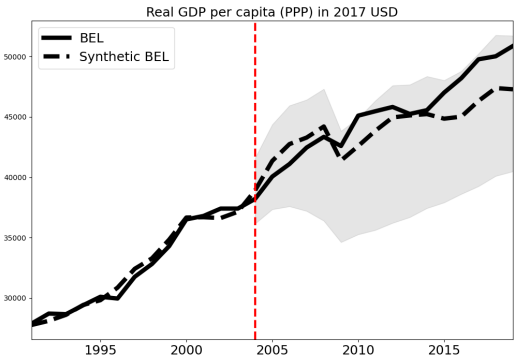
Back EU-2004 Back

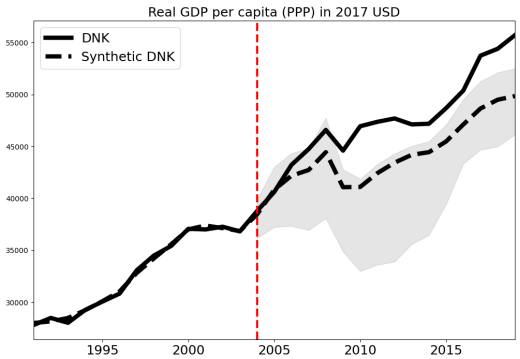


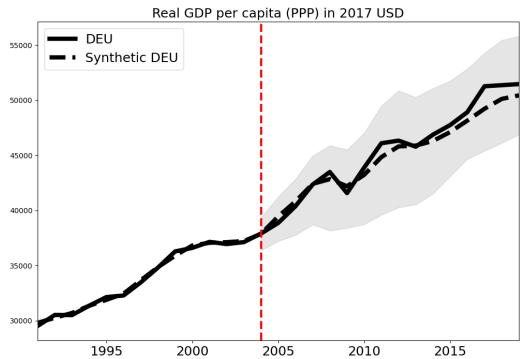
Individual Countries: EU-15

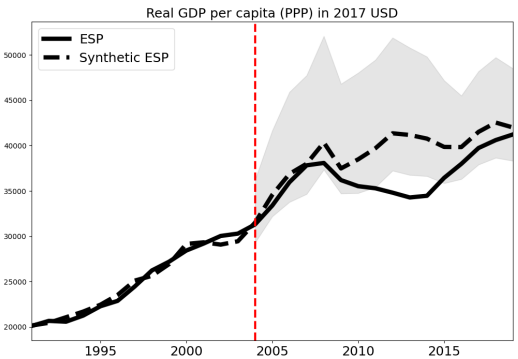
Back EU-15 Back

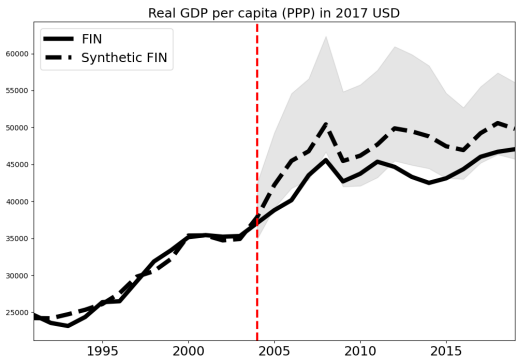


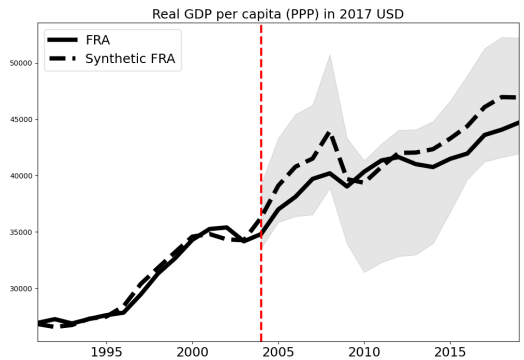


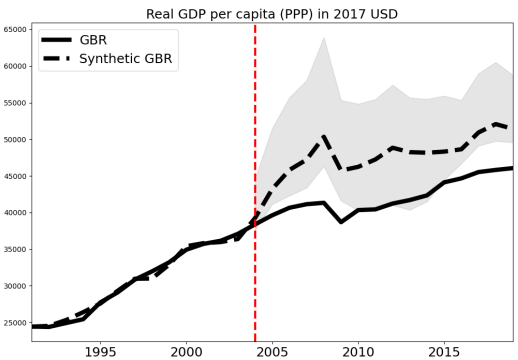


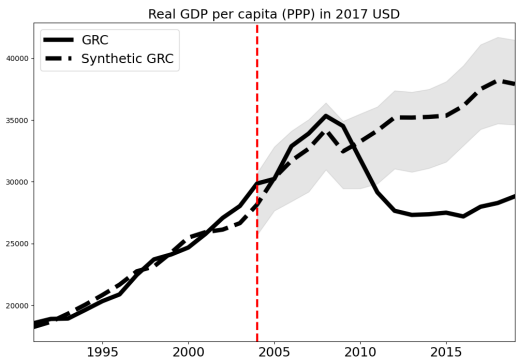






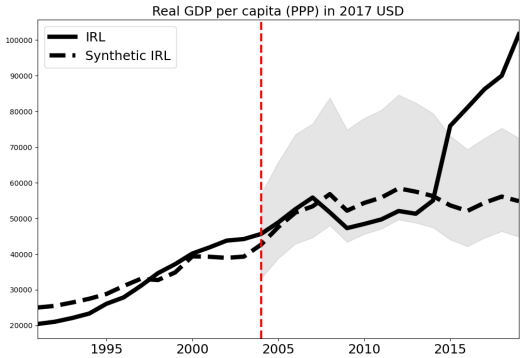


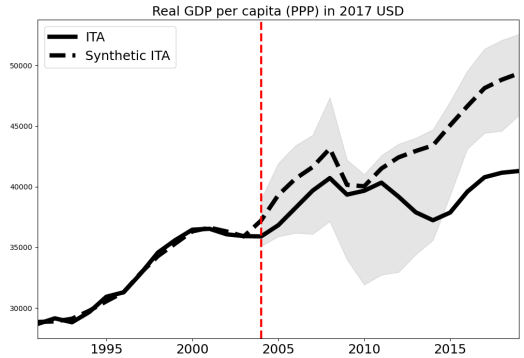


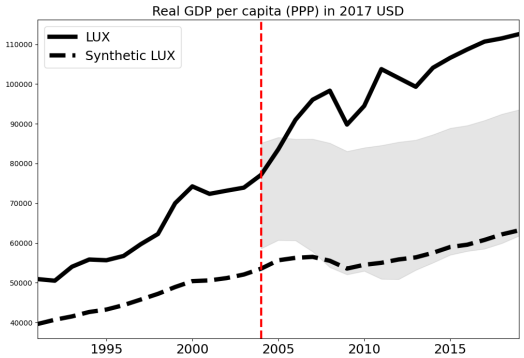


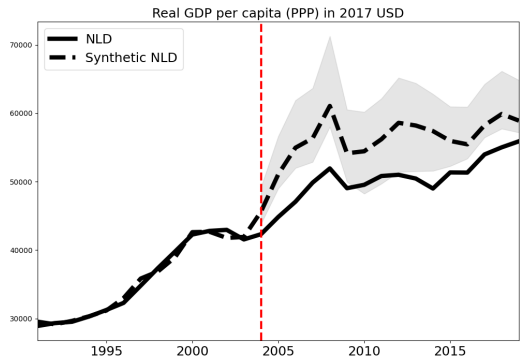
Individual Countries: EU-15 Cont.

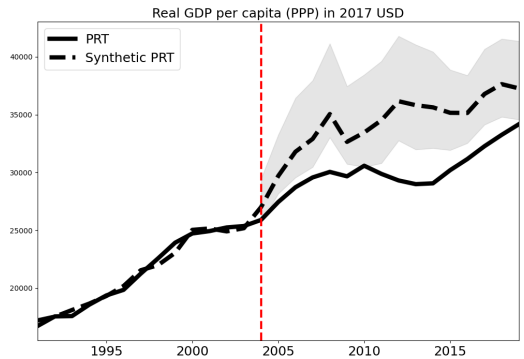
Back EU-15 Back

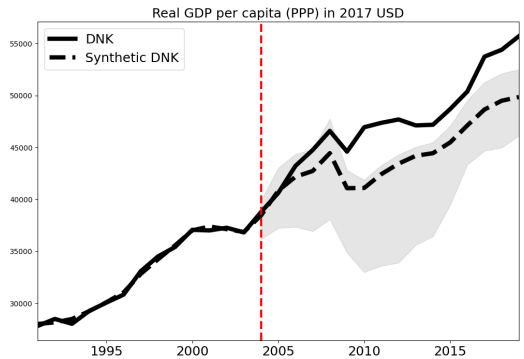


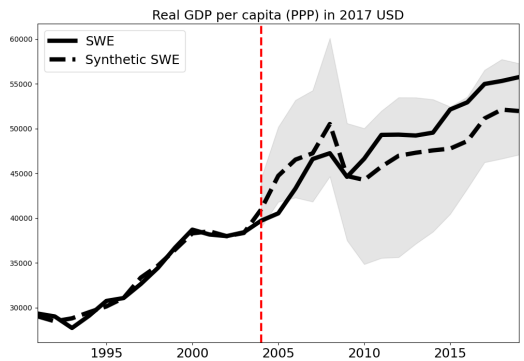






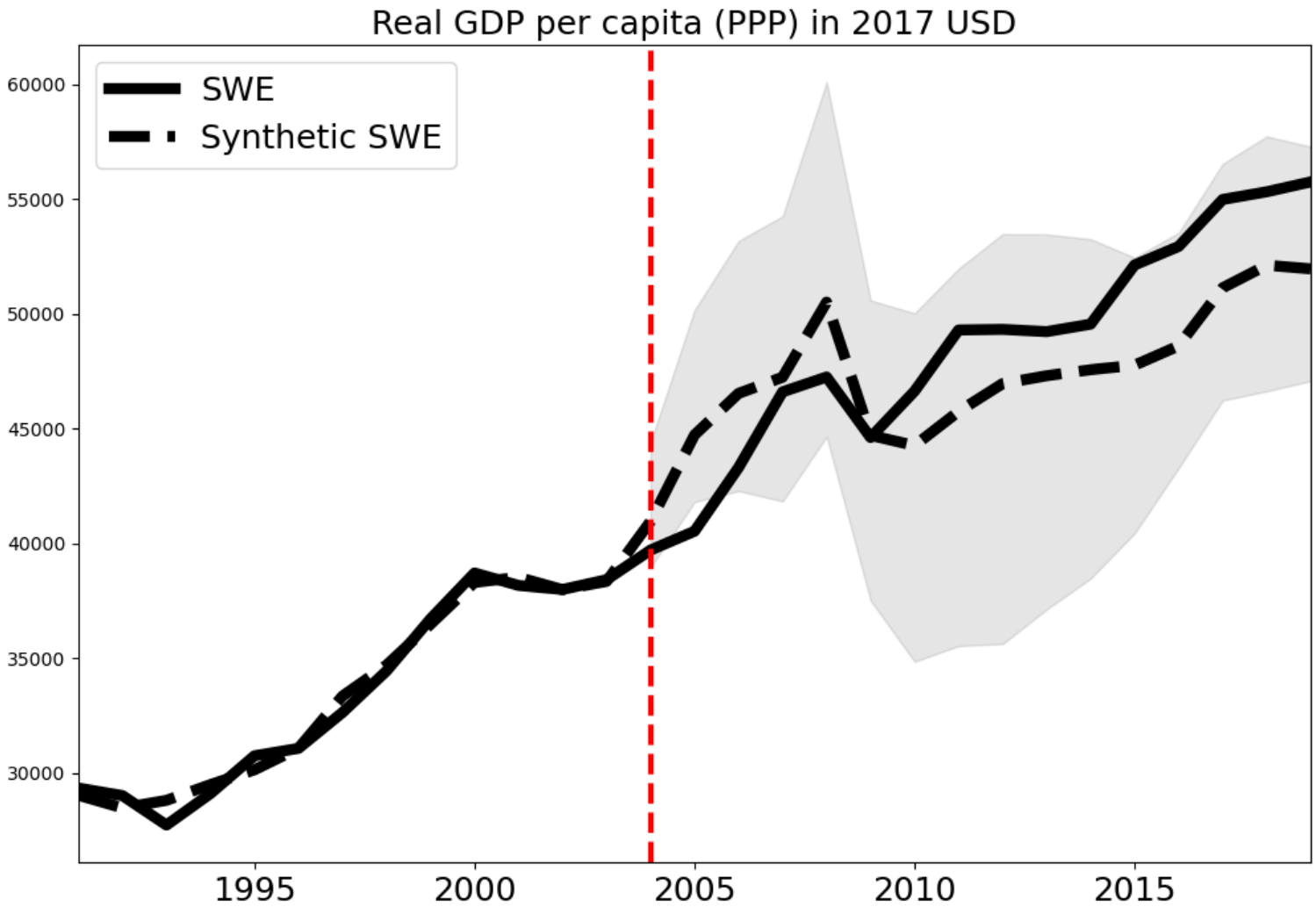






Individual Countries: Sweden

Back EU-15 Back



EU Effect in 2019

Back